THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXX. No. 1794.] LONDON, SEPTEMBER 28, 1897. [49TH YEAR. PRICE 6d.

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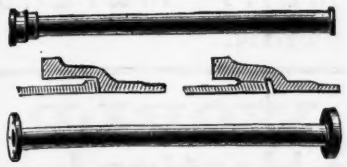
1¼ to 12 IN. BORE.



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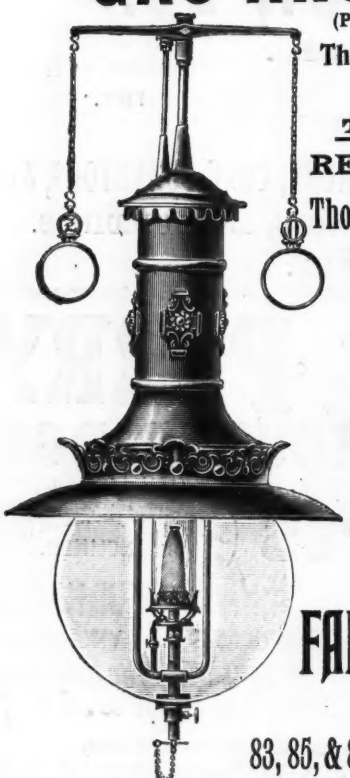

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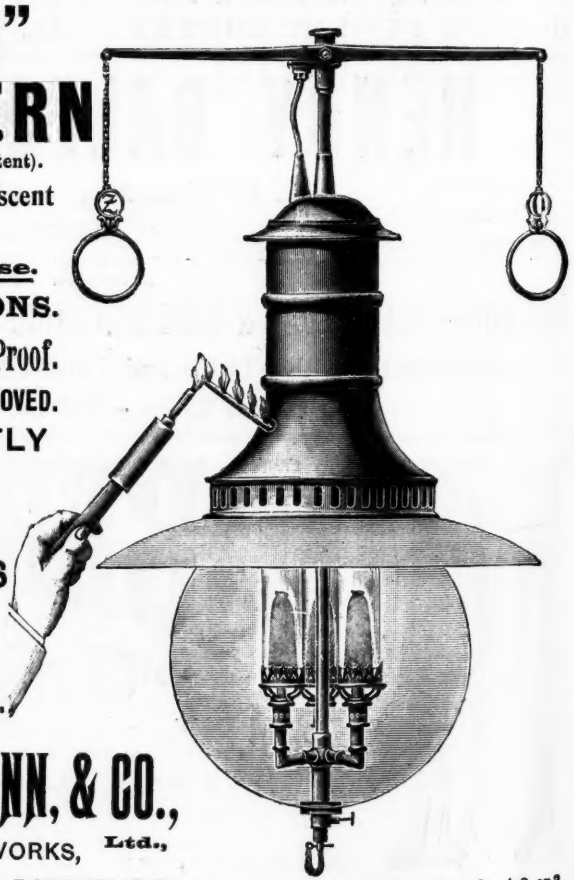

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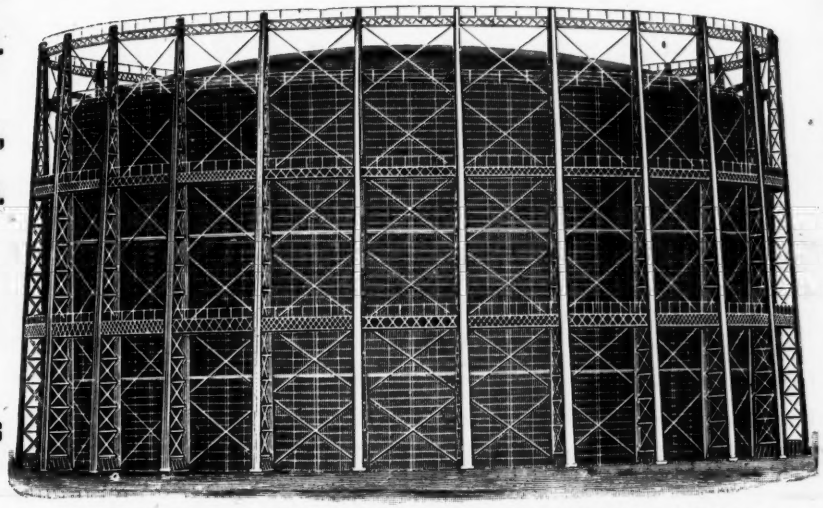

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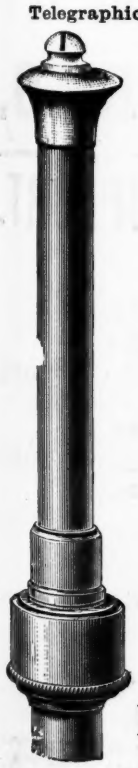

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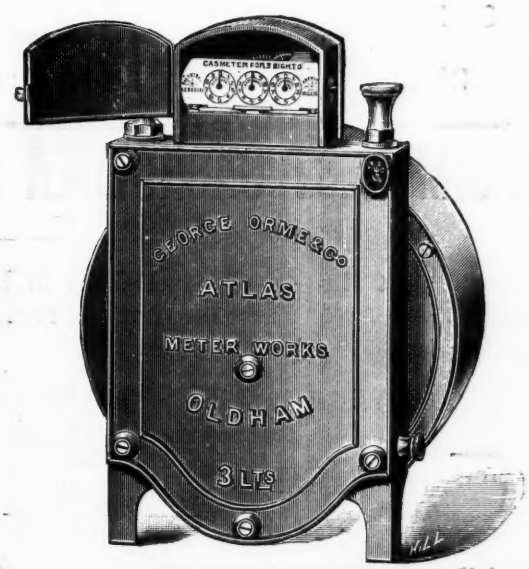

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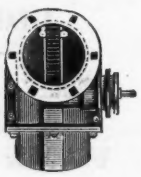

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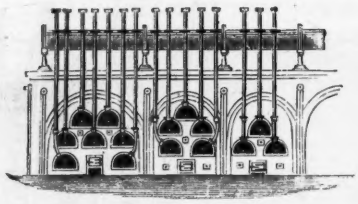

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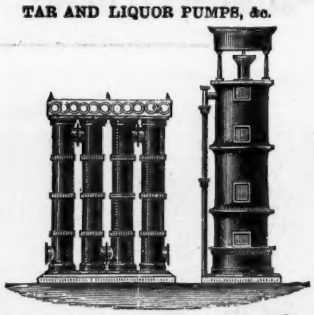

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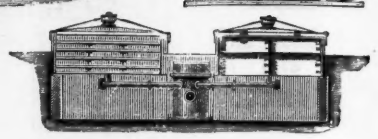

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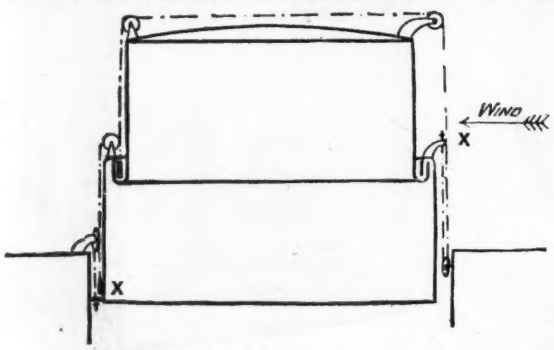

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A Gasholder on the Cable System can rely on a support which is exactly known in amount, is direct and simple in application, and is exerted through the strongest parts of the framework only.

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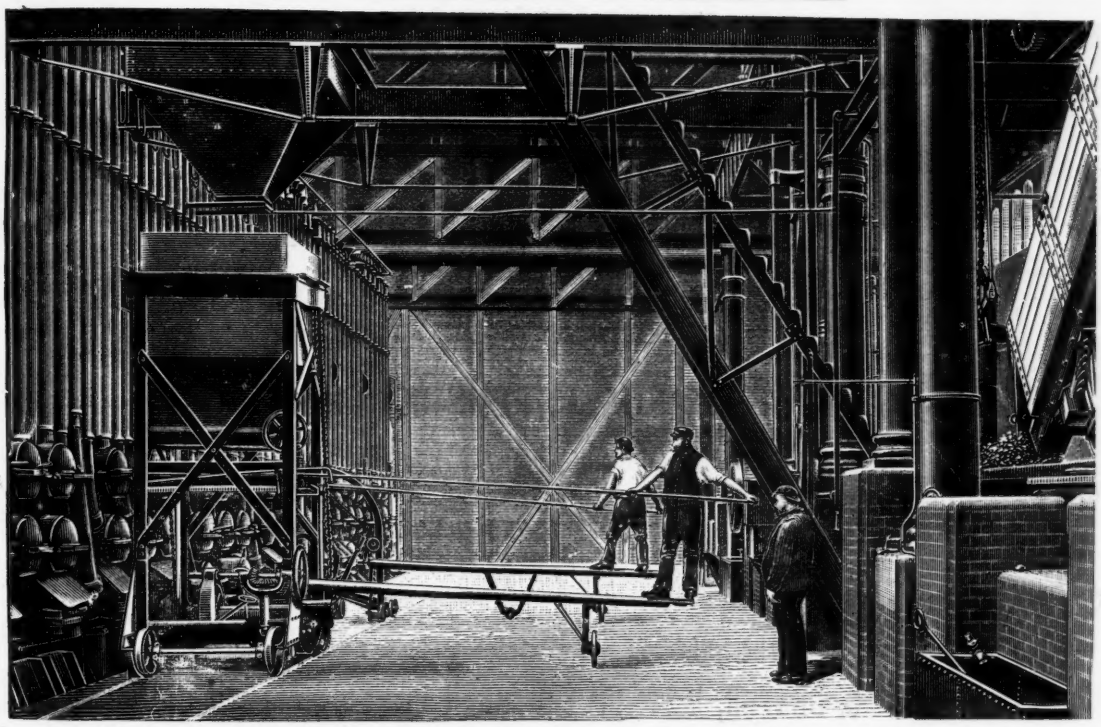

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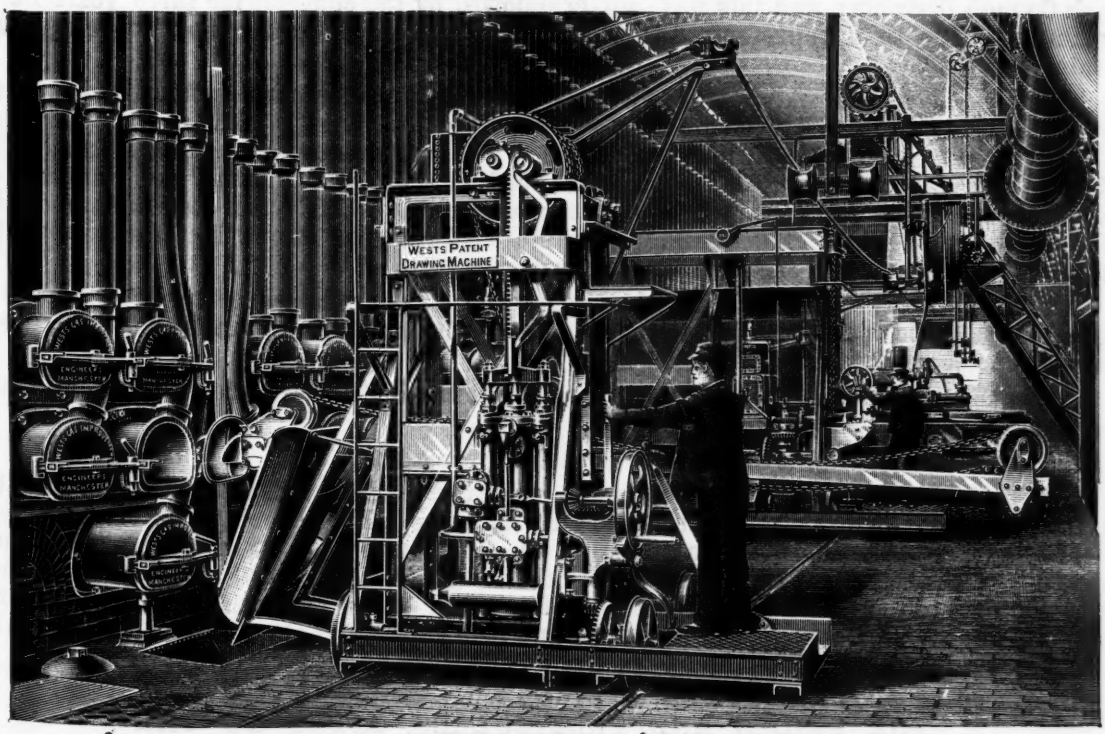

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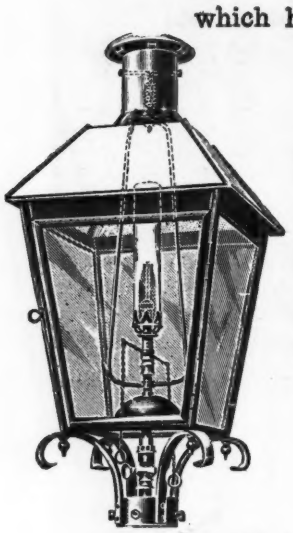

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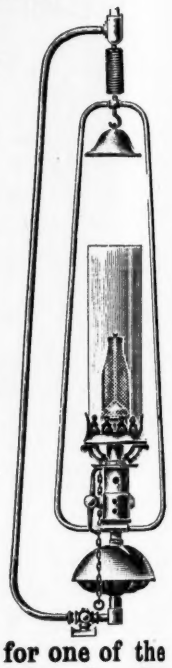

The following are Extracts from a PAPER read by Mr. F. G. DEXTER, before the SOUTHERN DISTRICT ASSOCIATION.

"The success of the experimental (Welsbach) lighting secured the contract for one of the Parish Council Districts; and this was shortly followed by the contract for three years for the city lamps. The total represents altogether about 500 single lamps, and 15 refuge lamps containing two lights."

"In the matter of maintenance of the street lights, the record is favourable—in fact, more so than the estimate provided. By the test-meter, the average daily consumption works out to 38 cubic feet per light, including bye-pass. The bye-pass consumes with a flame half an inch long, $\frac{1}{5}$ foot per hour. This represents 1000 cubic feet per lamp per annum. The average consumption per light, when in use, works out to 12,900 feet per annum, or about $3\frac{3}{5}$ feet per light per hour. The lighting is continued all the year round, from the average times of one hour after sunset to one hour before sunrise."

"The mantles have worked out to an average of three per lamp per annum; but, bearing in mind the absence of frost last winter, the writer believes that four mantles per light is more likely to represent average conditions."

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"The number of lights attended to per man averages 85."

"The 'Welsbach' Light is undoubtedly one of the greatest aids to successful competition that the Gas Industry has ever experienced. Its influence, while reducing the relative cost of light, has advanced the consumption of gas all over the country by the increased satisfaction of the existing consumers, and the attraction of others. The writer feels that its influence should not be confined to the house. It is capable of meeting every competitor in the street, from cheap oils to arc lights, in cost and in effect; and it is hoped that the foregoing experience may lead many others to seek its aid and to realize its efficiency."

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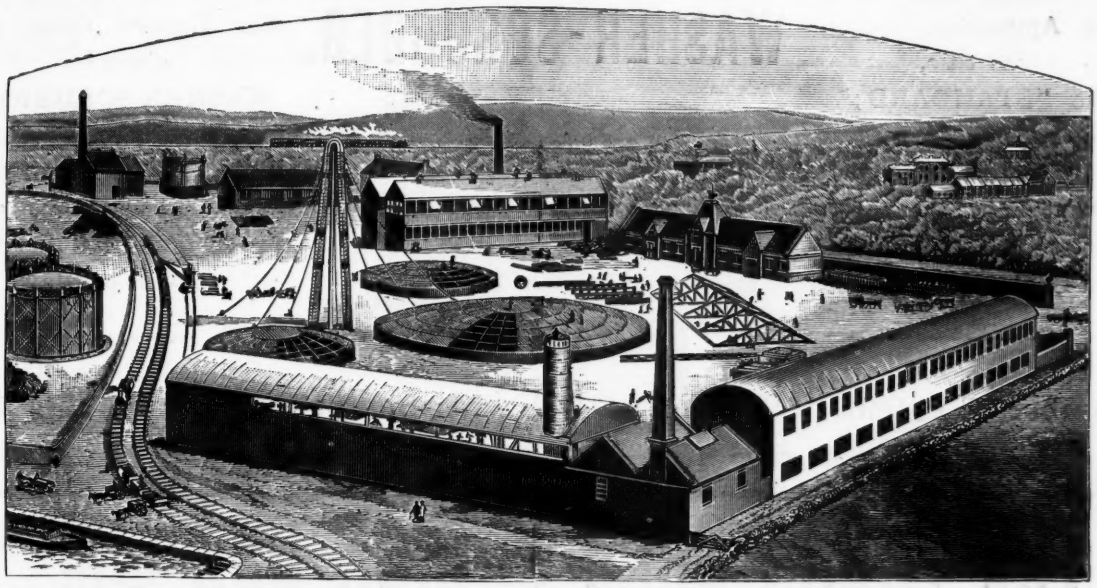

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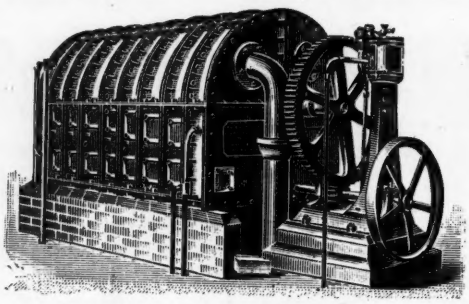

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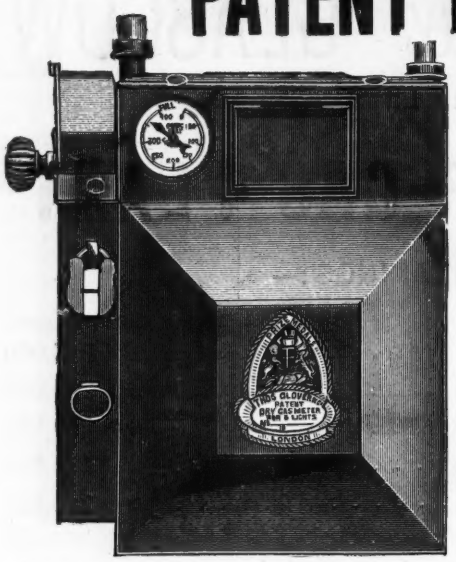

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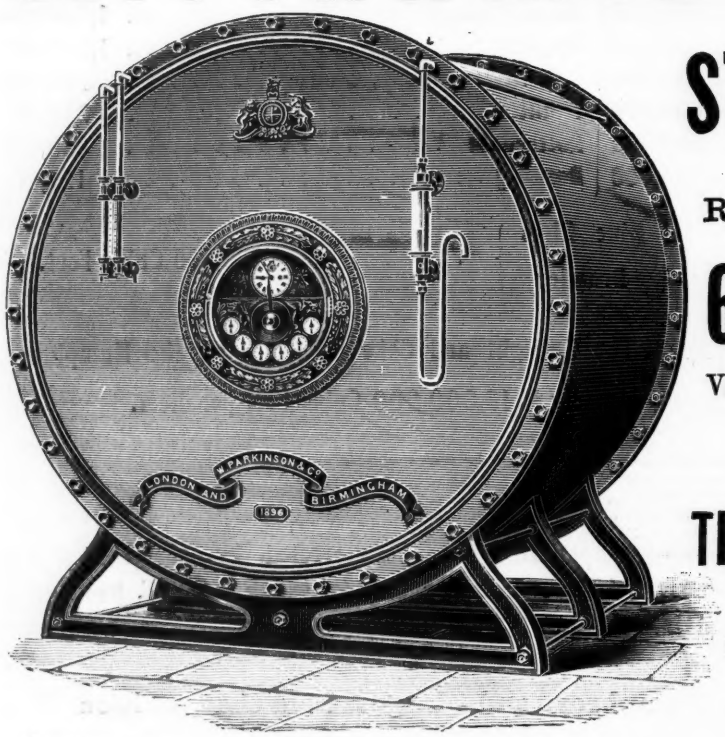

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IN

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EDITORIAL NOTES.

Settlement of the South Metropolitan Rating Dispute.

IT will be seen from the letter of the Chairman of the South Metropolitan Gas Company which we publish to-day that what the writer calls "the interesting experiment "of differential prices" in the Company's district, to compensate for inequality of rating, is not to be tried. The announcement will be received with satisfaction over a wider area than that of the parishes in which the extra penny was to have been charged. Mr. Livesey is careful to avoid emphasizing the point; but the statement that the rating authorities have met the Company very fairly may be interpreted to signify that the threatened reprisal served its intended purpose of bringing them to a sense of what the assessment of a Gas Company means. This is, after all, the main object to be attained in the actual state of assessment law and practice. So long as rating authorities regard gas-works as perfectly fair game for attack by any means permitted by the law, so long will it be hopeless to expect them to treat these "rich companies" fairly. Once let the same authorities understand and take to heart the lesson that the consumer pays the rates, and there is the dawn of a possibility of justice being done to the undertaking. Mr. Livesey's letter is a very interesting contribution to the controversy on the general subject which never fails to be revived every five years. The Company certainly appear to have scored a point in prevailing upon the Local Authorities to base the settlement upon the figures representing the result of the working of the undertaking for the twelve months ending last June, whereas the Court dealt with those for the account year ending June, 1895. It is at least a source of satisfaction—one piece of firm ground in a shifting mass of considerations more or less pertinent to the issue—that all the South Metropolitan parishes are now possessed of an assessment practically identical in terms. Whether 12 per cent. on the gross receipts is or is not a just assessment, it is something gained when all the parishes are united upon the figure. A general amendment of the law of rating is not, we fear, to be expected yet; but the fact that it has been possible to procure a mutually satisfactory settlement of the South Metropolitan dispute is a good augury for the avoidance or the reduction to smaller issues of similar disagreements in the future.

The wording of the Company's notice to the consumers, withdrawing the notification of an increase of price, will stand on record as explaining the manner in which this step has been rendered unnecessary. The consumers are informed that "the Directors have satisfaction in stating "that their representations to the Assessment Committees, "based on the difference between the profits of the Com-"pany in 1895 and 1897, have been met by a reasonable "reduction in the assessments." Consequently, the price of gas will stand, as before, at 2s. 3d. per 1000 cubic feet. If the majority of the affected consumers entertain but a hazy idea of the meaning of the first part of this notice, they will appreciate the conclusion. There will, however, be plenty of people to whom the meaning of the whole message will be perfectly plain, and who will remember it henceforward.

Competition of America with the English Engineering Trade.

By far the most important contribution to the strike literature of the past week is the statement elucidatory of the comparative circumstances of the engineering trade in England and America which appeared in "The Times" of the 23rd inst. The communication is in the form of shorthand notes of a conversation which took place a few days ago, in London, "between an English engineer and "a member of a large American firm of manufacturing "engineers." No names are given; and the identity of the gentleman who played Boswell to the American Johnson is effectually concealed. We imagine, however, that we could give a name to the latter that would not be unfamiliar to many of our readers. Unless we greatly err in our appreciation of the speaker's style and matter, he is the representative of a firm who are actually engaged in the task of making the American rivalry of British iron and steel building a reality. Mr. John Burns and his numerous satellites profess to scout the idea of there being any danger to the British engineering trade in competition from America or elsewhere; but that the fact does exist the following evidence will prove. During the last fortnight, every gas manager throughout the United

kingdom has had a circular in the following terms: "The "low cost of American raw materials allows us to offer "cast-iron pipe for from £3 15s. to £4 15s., according to "sizes and weights. Prompt shipments can be made from "stock; and we shall be pleased to submit figures for any "specification. Our standard weights are the same as "those used in England, and our tests similar." If this offer means anything, it indicates that the era of American competition with the home products has come.

With this preface, let us see what the American engineering employer has to say in explanation of his position. His raw material, as everybody knows, is very cheap and of excellent quality. In regard to labour, he enjoys the advantage of being absolutely untrammelled by Trade Union rules; and his workmen know nothing of the "Union "stroke." There are Trade Unions in the States, of course; but they appear to have given up the idea of regulating either the range of a man's work or the amount of his pay. The men get high wages—not so very much in excess of English rates, and hardly higher at all when appraised by the purchasing power of the dollar as compared with the shilling. They work ten hours every day except Saturday, when the time is nine hours. This makes a 59-hour week. The day is differently divided from the English custom. Work begins at seven, stops at twelve, recommences at one, and ends at six. This is the same rule that prevails in many parts of the Continent. There every man is paid according to his merit. The high rates of wages make every employer, foreman, and tradesman keen upon labour-saving machinery and devices. "All "the ingenuity of the employers and leading men of the "establishment is brought to bear upon the design and "manipulation of labour-saving machinery, with the "result that work is carried out with perfection, ex-"pedition, and lowness of cost such as would sur-"prise you. The workmen in this country do not "understand the situation, or are unfortunately ignorant, "otherwise they would never permit the trade of the "country to be ruined by arbitary trade society rules." The American workman is encouraged to earn as much money as he can; and to this end his own powers are the only limitation to the quantity of work he can turn out, by hand or machine. "A first-rate mechanic will lead a gang "and take charge of a group of machines with youngsters "and labourers to assist him. He will set a job in the "machine, start it, pass on to another, and so forth through-"out the group—keeping them all at the proper speeds, "and generally superintending the work. A boy will see "to the oiling, and keep an eye on the tool, ready to call "the man should anything appear to be going wrong. "Many of the machines are automatic, and, once set, "require little skilled attention. Now, what happens in "England? There is a good man—a first-rate energetic "fellow—put to work on a lathe. He sets a piece of "work and starts it; he then sits down, and that work "goes on the whole of the day—the man sits on a keg "practically rusting both mentally and bodily." Not for double wages will the English mechanic look after more machines, as he could very easily do. He is persuaded that he is protecting his industry and leaving work for others of his trade. The society really has him bound, body and mind. The American manufacturer attributes his success in competition mainly to the superiority of the mechanics as individuals and to non-interference of Trade Unions. The greater intelligence of American machine-shop hands is bred of the desire of the workman to earn as much as possible, and of the employer encouraging his efforts. "He does not, as the English workman "does, sit for hours watching an automatic machine; on "the contrary, his hands and his intelligence are fully "employed in his own and his master's interests, with the "result of higher wages and greater output. The spirit "of emulation is not crushed out of him by Trade Union "rules!" This is a tremendous indictment, and calls for an answer from somebody who is competent to give the other side of the picture. The "Daily Chronicle" pretends to dispose of the whole case by pointing to the disappearance of the American shipbuilding industry; but there are many other products of mechanical engineering besides ships.

The Meeting of the Shrewsbury Gas Company.

THE annual general meeting of the Shrewsbury Gas Company, which will be found reported in another column, was rendered noteworthy by the delivery by the Chairman, Mr. J. Spencer Phillips, of one of the strongest addresses in defence of gas that it has ever been our pleasure to read. The Shrewsbury Gas Company are prospering, of course, in their own undertaking, thanks to the perennial attractions of gas lighting and the ability of the Secretary and Manager, Mr. W. Belton, who is not the man to lose any of the benefits of an increase of over 8½ per cent. in the consumption for the past year. Though the Company are doing well, however, they are troubled, as ratepayers, by the machinations of certain speculators, who, having succeeded in achieving the remarkable triumph of floating an Electric Light Company with works costing more than £16,000 upon a paid-up share capital of £942, naturally want to crown their exploit by getting the whole thing taken over by the Corporation at a profit price. It is a remarkable condition of affairs, of which we do not remember to have heard the like in any other town in the United Kingdom. The wisdom of the people who refrained from subscribing for the shares of the Electric Light Company is abundantly proved by the failure of the undertaking to obtain any business worth speaking of. The speculation does not pay interest on the borrowed money with which it was launched; and yet there are those who would persuade the Shrewsbury ratepayers that it is to their advantage to purchase the plant at a structural valuation. The bulk of Mr. Phillips's speech was devoted to exposing this outrageous pretension, which can only be advanced in the interest of the people, whoever they are, who found the money that has been sunk in this unhappy venture. It was an exceedingly able effort, and should have its intended effect of saving Shrewsbury from having to redeem, out of the already overburdened rates, the loss which the reckless finance of some local speculators has brought upon them.

An Account of Fuel Gases.

MR. F. H. SHELTON has established quite a reputation as a chronicler of American gas manufacturing methods, and a recent article of his in the "Engineering Magazine," which is reproduced in another column, is quite up to his usual standard. It describes, in non-technical language, the extending use of gas in industrial operations—of course, from the American standpoint. With regard to the consumption of illuminating gas in the United States, Mr. Shelton states that the output of about a thousand towns and cities amounts to approximately 60,000 million cubic feet. This gas he declares to be used "chiefly for lighting, "largely for domestic cooking and heating, and to a moderate "extent for power purposes." In the absence of published accounts and reports of what transpires at the meetings of American Gas Companies, all such estimates must be chiefly guesswork. It is to be noticed that Mr. Shelton does not attempt to give the relative proportions in which town gas is utilized in the United States for the different purposes named, so that the reader is left to assign what value he pleases to the words "largely" and "to a moderate extent" in the quoted passage. We are not quite sure that it would be justifiable to employ any stronger terms than these in describing how ordinary illuminating gas is used in England, where it is generally supposed that the gas-kitchener, the gas-fire, and the gas-engine are more commonly to be met with than is the case with their American equivalents. Mr. Shelton goes on to discourse both pleasantly and instructively of the different kinds of gas known to commerce, and patronized more or less by the American people. The great native specialty in this kind—natural gas—is passed over somewhat contemptuously by the writer. Where an untutored newspaper scribbler would have been tempted to spread himself very much at large over this unique gift of Nature to the American nation, Mr. Shelton, as a Gas Engineer, can hardly find patience to write about it intelligibly. He admits the great heating power of natural gas—about 1100 British thermal units to the cubic foot; but he points out that it is only good for the same uses as other fuel gases. "To the mind of the "writer, the substitution for hard fuel of natural gas, "costing but little, and conveniently supplied under "pressure, is not a measure so progressive as to call "for special commendation. It is certainly nothing "in comparison with the skill and invention neces-"sary to successfully and economically make and "supply an artificial gas that advantageously displaces "solid fuels previously used." It must be credited

to Mr. Shelton for virtue that he ventured thus to remind his countrymen that there was no more talent involved in utilizing natural gas than in "coming in "out of the rain"—a test of very ordinary mental capacity. The singular thing about natural gas is that it has not been found possible to reproduce artificially anything like it on a commercial scale. Mr. Shelton claims for carburetted water gas the next place to the natural product of any manufactured article. Yet when carburetted up to 25 or 30 candle power, this artificial gas has a calorific value of from 725 to 760 units at most. Thus it is a far weaker fuel than the natural gas of Ohio, with its 92 per cent. of marsh gas. "There's the rub!" Natural gas is nearly all marsh gas, and has scarcely any more nitrogen in its composition than the best carburetted water or ordinary coal gas. If it is the result of a simple decomposition of oil, there is plenty of waste oil in the States; but nobody knows how to treat it industrially and commercially so as to make from it a gas which shall be nearly all marsh gas. Water gas pure and simple, as Mr. Shelton confesses, is impracticable for the purpose of commercial distribution as fuel; but it has some value when locally manufactured for use in fine forging, gassing fabrics, and so forth. Oil gas, made by carbonizing petroleum, is admittedly "too bright "and good for human nature's daily food;" and when diluted with air it only possesses about the same fuel value as "straight" water gas—300 units per cubic foot. Mr. Shelton's moral is that if manufacturers having heavy coal bills to pay would look more closely into the capabilities of the different kinds of gaseous fuel ready to their hand, they would in many cases find among them something greatly to their advantage. The conclusion is just; and the temperate way in which it is argued out will serve the cause better than the vapourings in which fuel-gas enthusiasts have only too often indulged.

The Compulsory Working of Patents.

A STRONG attack upon the English patent law has been recently made by a writer to "The Times," whose special grievance is the "careless liberality" with which it treats foreigners. According to this complaint, foreigners obtain full protection in this country by complying with the most ordinary formalities. They occupy the time of our Courts, often to an inordinate extent; they can enforce the extreme technical rights of a patentee, even to the grave prejudice of native industry and of the common weal; and they are not bound to render any services in return. The introduction into the English patent system of the French and German condition of working the patent in the country is indicated as an obvious remedy for some of these disadvantages. Incidentally, it is disclosed that though the compulsory licence clause of the last Patent Act has never been put into operation, there are at present several petitions before the Board of Trade asking the Department to compel foreign patentees to grant licences to English manufacturers. The result of these applications will be awaited with interest. The correspondent of "The "Times," however, thinks that the Board of Trade will be unable to do much in the matter; and he falls back upon his panacea of "compulsory working." The complaint brought out a vigorous reply from Mr. A. V. Newton, who declared that everybody acquainted with the subject regards the compulsory working clause of foreign patent laws as impolitic. This is a curious illustration of the familiar difficulty of curing abuses by what appear to be obvious remedies. Mr. Newton observes that the question of compulsory working was threshed out before the Institute of Patent Agents in 1887, when it was shown that no good, but evil, results from the carrying out of this provision. "The mistake is that the advantage of a successful patent "is supposed to accrue to the patentee only, whereas it is "the public that is mainly benefited—not, however, that "portion of the public that is selected to build the patented "machinery or work the patented process, but the much "larger portion of that public which uses the invention "and the results of the invention." Hence it does not matter to the public where the invention is worked or who profits by it, so long as they get the advantages of it. Mr. Newton claims to be primarily responsible for the much-debated clause 22 of the Act of 1883; and he is not at all inclined to the view that this part of the law is a dead-letter. He argues instead that the clause has effectually prevented the creation of an obstructive monopoly, and thinks that it strengthens the hands of the Judges in dealing with foreign patentees.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 697.)

THE course of business on the Stock Exchange last week fluctuated considerably. The markets opened fairly well, and activity seemed to be reviving; but the tendency soon became dull. Various disquieting rumours were in the air; and a rise in the Bank rate was regarded as inevitable at last. When, however, it was found on Thursday that the rate was only increased to 2½ per cent. (from the 2 per cent. rate which had lasted four months), things made another move upwards. This again in its turn gave way; and the close was dull and flat. Prices in general thus show a reduction, though the loss was not universal. The Money Market is much firmer; and with a seasonable demand, it should remain so. In the Gas Market, there was much greater activity than has been the rule of late, and transactions were more extensive, especially in the leading issues. Changes in quotation, however, are few and slight; and all, with one conspicuous exception, are in the upward direction. The general tendency is thus firm and favourable. In Gaslights, the "A," after standing very steady for some weeks without advancing, took one step back. It touched 317 once on Friday, but was a little better at the close. Small business was done in the secured issues, which were in request; and some of the debentures and the 10 per cent. preferences put up their price. A good deal was done in South Metropolitan. The best prices were obtained in the earlier part of the week; and they were not so well kept up towards the close. Commercials were quiet and unchanged. The Suburban and Provincial division again shows the most improvement—Alliance and British having advanced; but business actually done was very light. Of the Continental group, Imperial was extremely firm, and changed hands daily at good middle figures. The others were quiet; but European rose in price. There was nothing in connection with the remoter undertakings that calls for special remark. Transactions in the Water Companies were of the very quietest order; the entire business of the week amounting to only a poor day's work. But everything was firm; and several quotations had a fair rise. It may be noted that New River changed hands more than once at the nice round figure of 450.

The daily operations were: Gas opened steady, and remained rather quiet all Monday. Alliance rose ½. In Water, West Middlesex gained 2. Tuesday also was quiet; and prices were mostly unchanged. Gaslight "C," "D," and "E" moved up 2. On Wednesday, business in Gas began to get a little more lively; prices holding on firmly. European (fully paid) advanced ½. In Water, New River rose 2. Business was brisk on Thursday; but prices were not any better, though Gaslight 4½ per cent. debenture advanced 1, and British ½. In Water, East London was 2 higher. Friday was the busiest day of the week; the tendency remaining as before. Gaslight "A" receded 1. Saturday was unusually active; and prices in Gas were not changed. In Water, Chelsea advanced 2; and New River, 1.

ELECTRIC LIGHTING MEMORANDA.

An Indictment of the Meter System—Practice in the United States—An Analogy from the Coal Trade.

IT is a matter for impartial investigation and dispassionate discussion, which might well be debated at a meeting of the Institution of Electrical Engineers, or some similar body, whether the introduction of consumers' meters has in reality benefited the electric lighting industry of this country. It may appear at first sight absurd to raise the question, in view of the extent to which these appliances have been adopted in the United Kingdom and on the Continent; yet we are by no means sure that it could be answered with a very stong affirmative. From the commencement of commercial electric lighting, the need for a reliable meter was assumed, clearly with reference to the practice prevailing in the gas industry. Inventors set to work to produce the requisite article; and eventually, after a number of wonderful devices had been gravely offered to the world, something that would answer the purposes well enough was put upon the market, and the manufacture became an important branch of electrical engineering. At the present time, every central electric light station working in the United Kingdom supplies by meter; and the attempt to further popularize these instruments by adapting to them the automatic prepayment principle, is being more or less seriously prosecuted in different quarters. Notwithstanding all this strong *primâ facie* evidence of the commercial success of consumers' electricity meters, it is only necessary to look a little beneath the surface, or to listen to an assemblage of central station managers talking over the subject at an expansive moment, to obtain another view of the situation. At this year's meeting of the Municipal Electrical Engineers' Association, in connection with the suggestion that prepayment meters might well be encouraged, there was some very candid speaking respecting this whole class of apparatus, as actually available. The meters were

described as being too dear, too delicate, and not of that positive, reliable character as measuring instruments which is desirable for a "penny-in-the-slot" device for sale and delivery.

It seems pertinent to the question to inquire why consumers' electricity meters are comparatively so little used in the United States. There are doubtless many of this class of electrical instruments in service in that country; and they ought to be cheaper and not less reliable there than here. Yet we believe it is the rule that electricity supply in the States is still based upon the simple rental system that has been abandoned here in favour of the meter. There must be a reason for this; and it is open to anybody to believe that the reason is simply that the meters are not good enough to justify their adoption in the unprejudiced eyes of the intensely practical persons who run this business in the States. There is little municipal lighting there, with its possibilities of raising any amount of capital at low cost to be spent on meters or anything else. Every electric lighting station has to stand its own chance against perhaps half-a-dozen competitors, and cannot afford to encumber itself with useless complications of apparatus which might in the end create unpleasantness with the consumers. Consequently, the business of dealing in electricity supply for interior lighting is reduced to its simplest expression. There is no question of charging higher for lamps used at the period of the maximum load, or any other attempt to dodge the inevitable. The consumer is supposed to have the intention of using all the lamps he has fixed; and he is simply charged so much per lamp per hour, over an agreed time-schedule. If his consumption is likely to be of a particularly desirable kind, he gets some allowance in the shape of a discount. If one electric lighting company will not see matters eye to eye with him, another will; and so the deal gets adjusted, and business is carried on with the least possible friction.

Is not this very much what our own up-to-date electricians are aiming at with their "Brighton" and other modified meterage systems, designed to catch the consumer who wishes to use his lamps to please himself, and not with any regard to the convenience or the circumstances of the suppliers of current? Dr. Hopkinson has formally endorsed the principle of charging for being ready to supply, rather than for the actual quantity of electricity furnished; and the partition between this and the simple rental system is very thin. All which brings us back to the position from which we started, and gives point to the inquiry whether the consumer's meter, with its concentration upon the one consideration of quantity, has really been beneficial to the electric lighting industry. It is true that quantity is a consideration in electricity supply. But it is only one among others; and is not by any means the most important from the financial point of view. In short, electricity is not a ponderable, and can only be treated as such if other qualities are ignored. And when essentials are ignored, unpleasantnesses of various kinds are sure to happen. The whole tendency of the meter system has been to force electricity supply into the same category as the distribution of gas, to which it has not much more analogy, viewed from one aspect, than the supply of coals. The exigencies of the retail house-coal trade require, as it is, that the consumer should pay very much more dearly for his fuel than he need do if he could suit himself to the convenience of the colliery proprietor. If every householder could, and did, take in his year's stock of coal in the summer, in one consignment, it would be greatly to his own and the general advantage. Inasmuch as the jerry builder has determined that the average householder does not require room for storing more than a couple of tons of coal at the outside, this arrangement is impossible; and the coal merchant has to be paid for being ready to supply the householder with his fuel as he needs it. But if the necessities of the trade were such that the coal merchant had to send round to every one of his customers a daily supply of fuel, and all at the same time, it is obvious that the consideration of the actual quantity supplied would sink into insignificance in determining the charge that should be made. These are the reflections that help one to judge of the applicability of a meter system to electricity supply.

The Economical Gas Apparatus Construction Company, Limited—owners of the Merrifield-Westcott-Pearson carburetted water-gas patents—are leaving their City offices, Suffolk House, Laurence Pountney Hill, to take more advantageous quarters in Westminster; and their address in future will be No. 19, Abingdon Street, S.W. Mr. B. B. Waller, Assoc.M.Inst.C.E., is now associated with the Company.

The Rating of The Gaslight and Coke Company.—Our readers will remember that, on the occasion of the last half-yearly meeting of The Gaslight and Coke Company, the question of the rating of the London Gas Companies was brought prominently before the shareholders by the Governor (Colonel Makins) and Mr. George Livesey. The amount paid by the Company for rates comes to 2½d. per 1000 cubic feet; and the Governor stated that the Directors purposed taking steps to place this fact clearly before the consumers. This they have done by printing in red ink upon their forms of account a note setting forth that "the price charged for gas [2s. 10d.] includes an amount of 2½d. per 1000 cubic feet paid by the Company in the shape of rates to the Local Authorities, over whose expenditure the Directors have no control."

THE CONTINENTAL EXCURSION OF THE INSTITUTION OF GAS ENGINEERS.

As briefly recorded in last week's "JOURNAL," the Continental trip of the members of the Institution of Gas Engineers, "personally conducted" by the President, Mr. Corbet Woodall, was duly carried through all its pleasant stages between Tuesday, the 14th, and last Tuesday, the 21st inst. It was a somewhat hazardous experiment, having regard to the season and the calls upon the members' time; but the success of the enterprise was signal, and must have been most gratifying to the President, to whose initiative its inception was due, and to whose assiduous supervision the satisfactory realization of the ambitious programme is chiefly to be attributed. Mr. Woodall was ably and zealously seconded in his efforts by his colleagues of the Imperial Continental Gas Association service in Holland, whose kindness could not have been surpassed. It is unnecessary to repeat here the itinerary of the pilgrimage scampered through, with only too little time for the due appreciation of the "sights" arranged for, or met with, on the journey. In one respect the tour was designed "the wrong way about;" it began with Amsterdam and ended with Brussels and Antwerp. There were doubtless good and sufficient reasons for this order of progression. Since the objective of the trip was Amsterdam, and it was here that the Institution was to be entertained by the Imperial Continental Gas Association, it was obviously proper that the visitors should make the best of their way to this the principal scene of hospitality and centre of technical interest. But the effect was to place the *bonne bouche* of the banquet first in the bill of fare. Amsterdam is without peer or parallel among cities; and it is no disparagement of Brussels or Antwerp to say that, when seen for the first time with them in the same week, it puts them into the second order of impressions and remembrances. At Amsterdam, the hosts of the Institution were worthily represented by Mr. H. Salomons, who was indefatigable in ministering to the desire of the visitors to see all there was to be seen of the commercial capital of Holland and the gas-works that supply its principal needs in the way of artificial light. This opportunity may be taken for mentioning, as Mr. Salomons' lieutenants in the execution of this by no means easy task, the names of Mr. Louis Drory, Manager of the Haarlemmerweg station, Mr. W. Valon Watson, Manager of the Linnaeusstraat station, Mr. J. H. Franken, and Mr. W. Burls. The spacious sites, the noble architecture, and the perfect orderliness, cleanliness, and method observable at the Amsterdam Gas-Works constituted a lesson in one aspect of gas supply which it was worth travelling so far to obtain. Those engineers and architects who are solicitous to learn how common bricks and mortar can be used so as to build handsome gas-works, imposing railway stations, and a beautiful city, should certainly go to Amsterdam.

There was a grand dinner at Amsterdam on the Wednesday night, offered to the visitors by the Directors of the Imperial Continental Gas Association. Mr. C. Pigou, one of the Directors of the Association, was present, and expressed the regret of the Chairman, Mr. T. H. Goodwin Newton, at being unable to attend. Next morning, after an inspection of the grand Haarlemmerweg station, the party proceeded by steamer to the island of Marken, in the Zuyder Zee, which was as though one took a step backwards through the last three hundred years, and saw what the people of the Low Countries were like when the chief artificial lighting in vogue was that "torch" of the Reformation which, first ignited here, has never since been put out.

Upon quitting—with vain regrets—Amsterdam for The Hague, the visitors passed into the hospitable hands of the Municipal Gas Department of the Corporation, represented by Mr. J. Bakhuis and his assistant, Mr. Van Doesburgh, and of the Dutch Gas Managers' Association. Mr. Bruinischen Troost, of Sneek (the President of the Dutch Association), Mr. D. Van der Horst, of Utrecht, and Mr. Brender à Brandis, of Haarlem, were present as representatives of the Association. A visit was paid to the local gas-works, where the application of machinery to the carbonizing of coal by means of horizontal retorts is carried to a high stage of development. Here a graceful little ceremony of welcome was performed by Mr. Beirs, the Deputy Burgomaster, after which the visitors were driven through the town and on to Scheveningen, where they were entertained to lunch by the Dutch Association. It was only to be deplored that time did not permit of the fuller exploration of this delightful part of Holland.

At Brussels, the party received a welcome from M. Aerts, the Director of the Municipal Gas-Works, who also kindly arranged for the visitors to be shown over the Hôtel de Ville. Unfortunately, wet weather set in at this stage of the proceedings. But the resources of Brussels are great; and with an Exhibition in full swing, no difficulty was experienced in filling in the time comfortably until the hour of departure for Antwerp on the Monday morning. Here the members enjoyed the hospitality of their President, who provided lunch for the whole party at the Hôtel St. Antoine, at which function Mr. G. C. Trewby and Mr. J. Morris, of Jersey, found an opportunity for expressing the gratitude of the members and their favoured friends for Mr. Woodall's kindness throughout the preceding memorable five days. The rest of the time was spent in inspecting the Cathedral and the

world-renowned Plantin Museum, winding up with tea at the Hôtel St. Antoine and a procession through the rain to the homeward-bound steamer, which, unfortunately, left too late for the magnificent docks and wharves of the port to be seen.

Thus passed, and thus ended, what must in the nature of things stand, in the phraseology of the day, as the "record" autumn excursion of the Institution of Gas Engineers. Hardly again can this or any other technical society find itself in the possession of such extraordinary advantages for the members as those which this year attached to the presidency of Mr. Corbet Woodall over the Institution. A leader of his profession, not only in the United Kingdom but also on the Continent of Europe, Mr. Woodall occupies at the present moment a position in the gas engineering world which is truly unique. And all the resources of his high position and influence were placed at the service of the Institution with that liberality which has become proverbially associated with the name of Woodall. Influence and goodwill, however, would not have sufficed to command the successful issue of such a protracted and complicated enterprise as the visit of the Institution of Gas Engineers to Holland and Belgium, without the personal attention and control of an adept traveller and administrator of affairs; and this Mr. Woodall gave in fullest measure throughout what must have been a trying time. He has his reward in the consciousness that in this matter he has acted fully up to his opportunity and powers, than which there is no source of greater gratification open to mankind.

GAS ACTS FOR 1897.

THE following Acts of Parliament relating to gas supply became law during the past session; and are now abstracted according to our annual custom.

The Arundel Gas Act incorporates and confers powers upon a Gas Company originally formed in 1840. The capital consisted of £2730 of original 10 per cent. capital, £4060 of original 7½ per cent. capital, and £1300 of original 5 per cent. capital. All this was paid up; and there was no mortgage debt. In the incorporation of General Acts, it is expressly provided that the provisions of the Gas-Works Clauses Act of 1847 with respect to the breaking up of streets for the purpose of laying pipes shall not apply to the ancient bridge commonly known as Arundel Bridge. The capital of the Company is to be converted into consolidated ordinary stock to the amount of £12,850, with power to raise £25,000 additional capital, all bearing 5 per cent. dividend. Borrowing powers are given to the extent of £2000 on the original capital and one-fourth of the new capital as raised. Interim half-yearly dividends may be declared. Additional lands are to be acquired; and the plans of the buildings to be erected thereon are to be approved by the Duke of Norfolk, as owner. A belt of trees is to be planted and maintained for ever along two boundaries of these lands. The standard price of 15-candle gas is 4s. per 1000 cubic feet, subject to the sliding-scale, with the modification that there is to be no increase of dividend above the standard rate in any one year during any part of which the net price charged by the Company shall have been or exceeded 3s. 9d. per 1000 cubic feet. The period of error in defective meters is limited to the current quarter.

The Ashford Urban District Gas Act authorizes the purchase of the undertaking of the Ashford Gas and Coke Company, Limited, by the District Council for 24 years' purchase of the maintainable profits; the amount of such profits being determinable, in case of difference, by Mr. J. Shiress Will, as sole Arbitrator. The value of the stocks and stores is to be paid, the mortgage debt taken over, and £500 paid towards the Company's expenses. The present Manager is secured in the possession of an annuity. Mr. Will has made his award; but it may be mentioned that the Act provides that "in the event of the death, unwillingness, or inability to act of the said J. Shiress Will, the question above referred to him shall be referred to, and settled by, some other arbitrator to be appointed by the Company and the Council, or, in default of agreement, by the President of The Gas Institute." The maximum price of 15-candle gas supplied within the district is 4s. per 1000 cubic feet, and 10 per cent. extra outside. The period of error in defective meters is limited to the current and last preceding quarters.

The Cowes Urban District Council Gas Act provides for the transfer of the undertaking of the Cowes Gas Company to the District Council, and authorizes the latter to carry on the undertaking. The transfer is to date from the commencement of next year; the consideration being ascertained by agreement or arbitration. The stock and stores must be paid for within ten days after the date of transfer. The limits of supply by the District Council are the parishes of Cowes and Northwood. The maximum price of gas is 4s. 6d. per 1000 cubic feet. The gas capital is to be paid off in 40 years.

The Hunstanton Water and Gas Act dissolves the Hunstanton Water Company, Limited, and the Hunstanton Gas Company, Limited, and re-incorporates the proprietors therein as a new Company for the supply of water and gas to Hunstanton and the neighbourhood, in the county of Norfolk. The limited Gas Company was formed in 1870, and established gas-works upon leasehold land; the lessor covenanting to concur at any time with the majority of the other shareholders in applying for parliamentary powers. The share capital of the limited Company consisted of £2600 fully paid up, with £1100 borrowed on mortgage, and an overdraft. It was agreed between the Company and the District Council of New Hunstanton, in consideration of the withdrawal of opposition by the latter to the Bill, that power to purchase the undertaking should be granted to the Council. The limits of the Act are the parishes of Hunstanton, New Hunstanton, and Heacham. The capital of the statutory Company is £30,000, of which £4800 is original, and £5200 additional gas stock, bearing the usual rates of dividend. Separate accounts are to be kept of the water and gas undertakings, all expenses of direction, &c., being allocated between them as nearly as conveniently practicable in proportion to the relative capital expenditure. Borrowing powers in respect of the gas capital are granted in the usual proportion of one-fourth of the amount of both classes of capital. Power is given to acquire the reversion in fee simple of the site of the works in consideration of the allotment to the owner of £200 in fully-paid shares. The maximum price of 15-candle gas is fixed at 5s. 6d. per 1000 cubic feet. The prescribed burner for testing the gas is to be the usual Sugg's "London" argand No. 1, "or such other burner as the Board of Trade may allow." It is further enacted that the Urban District Council of New Hunstanton shall purchase, and the Company shall sell the undertakings before the 1st of October prox., upon terms set out in detail. The sum paid for the gas undertaking is made up of two amounts of £4050 and £1100, with £650 for expenses. The Company retain the gas reserve fund, as well as all moneys in hand and all gas-rental due to the date of the transfer; and they are paid for all materials and stock in hand.

The Malvern Link Gas Act sanctions a scheduled agreement for the transfer to the District Council of the undertaking of the Malvern Link Gas Company, Limited. The present Manager and Secretary of the Company are to be compensated for any loss of office or diminution of emoluments they may experience as the result of the transfer. Provision is made for the delimitation of the gas districts of the Council and the Malvern District Council. The maximum price of 15-candle gas is 5s. per 1000 cubic feet within the district, and 20 per cent. extra beyond. The money borrowed for the purposes of the Act is to be repaid in 40 years.

The New Hunstanton Water and Gas Act is the counterpart of the Company's Act above noticed. It empowers the District Council to take over and carry on the undertaking of the Water and Gas Company. The maximum price of gas is 6s. per 1000 cubic feet, subject to certain discounts. Original gas loans are to be repaid in 50 years, and money borrowed for works extensions and improvement in 40 years.

The South Metropolitan Gas Act applies solely to the qualification of Directors of the Company. It is rehearsed in the preamble that by the Company's Act of last year the qualification of an employees' Director was fixed at £250 of ordinary stock, and that of an ordinary Director at £5000; and it is declared to be expedient that these amounts should be lowered. The present Act accordingly reduces the former figure to £100, and the latter to £2500.

The Swadlincote Urban District Council's Gas Act empowers the authority named to acquire the undertaking of a Gas Company formed in 1859, at a price ascertained by arbitration. Gas of 15-candle power is to be supplied at the maximum price of 4s. 6d. per 1000 cubic feet within the district, and 5s. beyond. Gas loans are to be paid off in 45 years.

The Taunton Gas Act is the first new scheme of legislation the Company have required since their Provisional Order of 1871. The existing capital is £35,000, bearing 8 per cent. dividend; and additional capital to the amount of £40,000 is authorized. In addition thereto, there is by this Act created, in respect of moneys expended by the Company out of revenue on capital account, new stock to the amount of £1750, to be deemed fully paid up, and entitled to a fixed perpetual 5 per cent. preference dividend. [The Bill asked for £3500 on this account.] The usual borrowing powers are granted. The initial price within the borough is 3s. 9d. per 1000 cubic feet, and 4s. 3d. outside the inner district. It is provided that "no increased dividend beyond the standard rate of dividend shall be paid in respect of any year during any portion of which the net price charged to any consumer (after allowing for any discount which may be claimable) shall have amounted to 3s. 6d. per 1000 cubic feet within the area or square hereinbefore described, or 4s. per 1000 cubic feet outside such area or square." Gas of 15-candle power is prescribed, without any definition of burner.

The Tuxford and District Gas Act incorporates a new Company for the purpose of supplying gas within the parishes of Tuxford, East Markham, West Markham, Egmanton, and Weston, in Nottinghamshire. The Tuxford Gas Company, Limited, were the owners of gas-works supplying part of the district; the undertaking having lately been sold to private owners who are among the Directors of the new Company which is authorized to take over the property. The district already stated is the limits of the Act, subject to the provision that priority for the supply of West Markham and Weston is reserved for three years to the Duke of Newcastle. The capital of the Company is £20,000, with the customary borrowing powers. The purchase of the old Tuxford works is

to be by agreement. The standard price for 15-candle gas is 3s. 9d. per 1000 cubic feet. No penalty is to be incurred by the Company in respect of defective supply due to unavoidable cause or accident, "provided that the want of sufficient funds shall not be held to be an unavoidable cause or accident." Power is given to the Company to apply for, and carry out, an Electric Lighting Order, out of their ordinary funds. The Company are not to oppose generally any Bill promoted during the next three sessions of Parliament by the Local Authority of Tuxford for the acquisition of the undertaking.

The Tynemouth Gas Act empowers the Tynemouth Gas Company to consolidate their capital, and convert it into a general capital stock of £118,742 bearing a uniform 5 per cent. dividend. Additional capital to the amount of £75,000 is authorized, with borrowing powers to the extent of one-third. The maximum price of 16-candle gas is 3s. 4d. within the borough, and 3s. 6d. outside for the next ten years, after which it is to be reduced to 3s. 4d. Discounts ranging to 20 per cent. for large consumption are ordered on accounts paid within 14 days of becoming due. A special clause provides for the appointment of a gas examiner. The gas is not to show a blackened acetate of lead paper test on one minute's exposure, nor to contain more than 20 grains of sulphur impurity in 100 cubic feet. In the event of the examiner finding any defect of illuminating power or purity in the gas, he is to forthwith give notice thereof to the Company at their office. Special provisions are made for the public lighting.

The Weymouth Consumers' Gas Act enlarges the district of supply to include the parishes of Upwey and Broadwey. The price of 15-candle gas is limited to 4s. per 1000 cubic feet within the old limits, and 4s. 6d. within the extended limits. The ordinary capital of the Company is consolidated, and converted into £74,000 of original consolidated 5 per cent. stock; and authority is given to raise £40,000 of new stock. Borrowing powers are in the usual proportion. No penalty for defective supply is to be incurred by the Company if the result of unavoidable cause or accident. The Company are empowered to apply for an Electric Lighting Order, using their funds for the purpose of the application.

THE CONGRESS ON TECHNICAL EDUCATION.

[Third Article]

One of the speakers at the Congress—Professor J. Wertheimer, Principal of the Merchant Venturers' Technical College, Bristol—did good service in reviewing the various examinations for which British technical students are invited to present themselves. He pointed out that schemes of examination influence the education of a nation mainly in three ways. In the first place, they serve to mark out lines of study by the syllabuses they set forth; in the second, they fix standards of attainment by the amount of knowledge they require for various grades of success; and, lastly, they offer incentives to students and teachers in the shape of the distinctions and prizes which reward conspicuous success. "The influence of any particular scheme of examination on the progress of education is good or bad just in so far as its syllabuses are wisely chosen, its standards of success fixed neither too high nor too low, and its distinctions and prizes so awarded as to offer a premium for intelligent work, rather than for mere cramming of facts and theories." Judged from this standpoint, Professor Wertheimer thinks that the examinations of the Department of Science and Art have had a beneficial influence on the progress of technical education, though they have also done not a little harm. He hails the recent appointment of Captain Abney as Director for Science as an augury of better things. As to the City and Guilds of London Institute, Professor Wertheimer supports the opinion we have often expressed, that while the examinations of the Institute having undoubtedly exercised a beneficial influence on the teaching of technology, there is still room for improvement in the syllabuses; and it is very desirable that the Institute should insist more largely on evidence of practical skill. It is suggested that the examinations and preparatory classes would be popularized if, in place of the present certificates, a "journeyman's," and a "foreman's" certificate respectively were issued to artisans who produced evidence of the necessary training in the workshops of an approved firm, and who subsequently passed the Institute's theoretical and practical examinations. The Honours Grade certificate might then be made still more difficult of attainment than at present, and would be suitable for those desirous of becoming captains of industry. Professor Wertheimer took the opportunity of denouncing the scheme of the Plumbers' Company for the examination of plumbers, as being superfluous and mischievous, seeing that the City and Guilds Institute already covers the ground.

Mr. Edwin O. Sachs described the course of study in architecture and engineering at the Berlin Technical College, and drew the comforting conclusion that no young English architect or engineer need run after the kind of instruction purveyed at this sumptuous establishment, which, indeed, he characterized as constituting a warning rather than as offering an example. Mr. T. R. Ablett wished to advocate the better and more extensive teaching of drawing, observing that the individual who can draw with ease and accuracy can gain skill in any kind of manual industry much more quickly than would be possible without such power.

Mr. W. R. Lethaby read a thoughtful paper on "Technical Education in Architecture and the Building Trades," in which many of the criticisms of modern architecture and its professors that have from time to time been offered in these columns found effective expression. Mr. Lethaby refused to distinguish between architecture and building. The architecture of London, truly so called, is not the self-conscious bank or insurance building, but it is the whole mass of building from Bow to Putney and from Hoxton to New Cross. "The question of education in architecture is therefore not a question of nice scholarship which might affect the more costly buildings, half-a-dozen restaurants, clubs, and insurance offices; it is the question of influencing the building of mean streets and the ordinary dwellings and meeting-places of men." Men build as they are. "We are revealed to ourselves in the corrugated iron shed, the mean meeting-house, the restored cathedral, the sham Gothic church, the dull workhouse, the silly villa, and the general vulgarity of the streets." Our own idea over again—the modern architect cannot design a satisfactory lamp-post! This is mainly because he is a scholar and a sketcher, and has only an imperfect perception as to what are the wants of people in the street.

Professor Silvanus P. Thompson took up his old parable that "success in answering questions set in a paper is at best only a paper success; and education which is not technical is not technical education." He declared that education to be technical must have regard to the requirements of the individual in and for his business in life. The training of engineers should be of a very high order, and cannot be had everywhere by reason of the high degree of specialization and the extent of the equipment of the institutions where it is to be obtained. He expressed the opinion that in the teaching of real chemistry, such as is needed in the arts and industries, Germany and Switzerland are far ahead of this country. There was a long and instructive discussion on Professor Thompson's paper. It was generally agreed that, while the County Councils and other local and semi-private bodies can do much good in enabling artisans to get a little technical instruction which will help them in their work if their heart is in it, nothing like the proper and thorough teaching of chemistry, engineering, or electricity can be expected of anything short of a Government institution.

One of the most interesting papers of the Congress was that of Mr. W. Slingo, whose name is known as that of one of the authors of a very good manual of electrical engineering. Mr. Slingo described the difficulty that keeps young workmen out of our polytechnic and technical schools; and he explained how these get filled with mere certificate-hunters. "One City clerk was in his year the prize carpenter in the United Kingdom; another took the prize in electric lighting, another in electrical instrument making, another in tools; while another, who had never been out of London for more than a week or two at a time, obtained a certificate qualifying him as a teacher of agriculture. A schoolmaster became a prize electrical engineer, and an ironmonger's clerk a prize electrical instrument maker. Another teacher who had in all probability never seen the inside of a telegraph station blossomed forth as the first prizeman in telegraphy, and was inferentially the best-trained telegraphist in the kingdom." It is not the principle of examination that is to be blamed for these absurdities. The fault lies with examiners, "who too often base their examination papers solely on certain text-books, ignoring altogether the thousand-and-one points of detail and application which never get into text-books at all." Mr. Slingo suggested several remedies for the evils he pointed out; chiefly insisting upon the requirement that examiners, teachers, and students should all be actively employed in the trades which form the subject of the training.

Commercial education was wisely treated by Mr. H. W. Eve, the Head Master of University College School, and Dr. Richard Wormell, Head Master of the Central Foundation Schools of London. Among other good things, Dr. Wormell said: "Take all the demands made upon us by all employers and directors, merchants, manufacturers, engineers, professional men, and statesmen, select from them the part which is common, and you find it consists of a demand for intelligence, wisdom, sagacity, soundness of judgment, clearness of perception, and common sense, and these are the products of a sound and broad general education." We may perhaps add what was said by the almost forgotten Andrew Yarranton, nearly two centuries ago: "Common honesty is as needful in kingdoms and commonwealths that depend on trade, as discipline is in an army; and where there is want of common honesty in a kingdom or commonwealth, from thence trade shall depart. As the honour, honesty, riches, and strength of nations are, so will be their trade. These are five sisters that go hand in hand and must not be separated." Dr. Wormell was followed, among others, by Mr. T. A. Organ, who brought the question to a practical issue by declaring that he had looked in vain "for a school prospectus which states that an old boy has distinguished himself and brought honours to his school by becoming the manager of a drapery establishment, the chief clerk of a bank, or the chief engineer on board a liner. On the other hand, reams of paper are devoted to advertising the University scholarships won by lads who have been forced in the educational hothouse

into brilliant, yet feeble plants, which will die fruitless when placed out in the world."

The last paper which we can notice here is that of Professor W. A. S. Hewins, who is the Director of the London School of Economics. The extension of the teaching of economical science is a reform that we have urged in these columns many a time and oft; and it is gratifying to learn that the experiment with which Mr. Hewins is identified is proving fairly successful. It is notoriously difficult to interest the young Englishman in what are called abstract subjects; and it is only in later life that he discovers, sometimes by painful experience, that these subjects have a practical value of their own which it would have profited him to appropriate betimes. Take, for example, the vexed question of local taxation. Few considerations which weigh heaviest with that hypothetical individual, the "practical man," touch him more closely than rating. Yet a very high authority upon this subject recently told Mr. Hewins that one of the main difficulties in unravelling the question of the incidence of local taxation is "the incomplete treatment given to that subject by economic writers." So it is with all the other unsolved problems of finance, labour, and trading enterprise. Confronted with them, the practical person is as likely to go wrong as right, unless he has a glimmering, however faint, of a reliable fundamental principle. The busiest, the most adventurous men of affairs, if questioned upon the point, would confess freely enough that their judgment upon many problematical concerns is usually guided, if not determined, by their faith in one or two quite simple, even homely, bits of proverbial philosophy. What a world of meaning, for example, is condensed in the maxim which assures us that "the worth of anything is just as much as it will bring." The proper office of a School of Economics is to condense the products of commercial experience in all ages, and adapt the result to the requirements of men of the time.

We have devoted a considerable amount of the limited space at our disposal to making our readers acquainted with the gains, such as they are, of the International Congress on Technical Education. As a result of our labours, those of our readers who feel the need of further education for themselves or for others dependent upon them for guidance and assistance in this respect, may learn from these condensed comments how best to set about obtaining what they desire. It has been no light task to reduce to these proportions the solid matter which fills half-a-dozen numbers of the "Journal of the Society of Arts;" but, while referring the curious student to this publication for all the details of the papers and discussions, we believe we have not overlooked any really important points demanding the attention of the young manufacturing engineer or chemist. The future of the world's industries is unquestionably with the rising generation of engineers and chemists, who have an indisputable claim to be informed how and where they can best equip themselves for the performance of the task that lies before them.

Acetylene as an Illuminant.—On the occasion of the recent visit of the German Emperor to Buda-Pesth, the city was brilliantly illuminated; and one of the chief agents employed was acetylene. The results are reported to have been highly satisfactory.

Asphyxiation by Gas Proposed as a Substitute for Hanging.—The "American Gas Light Journal" is responsible for the following: A Bill is being prepared by several leading physicians of Pennsylvania, for presentation for action by the Pennsylvania Legislature, which has for its object the abolishing of hanging as a capital punishment, and the substitution therefor of asphyxiation by gas as the proper method of administering the death penalty.

Natural Gas in Philadelphia.—A discovery of a remarkable kind is reported from Philadelphia. For some time past the proprietors of a stock yard near the city have been much troubled by the bubbling out of gas from wells sunk on their land, the effect of which was to render the water disagreeable for drinking and unfit for some other purposes. By accidental contact with a torch, it was found that the gas was combustible; and experiments have proved it to be a capital illuminant. It has been used, therefore, for lighting all the works; and there appears to be enough to light half the city.

Devastation of a Gas-Works.—The floods which prevailed in the mountainous region of Northern Austria during the last days of July wrought havoc in the town of Hohenelbe, in the valley of the Upper Elbe, in Bohemia. Three of the five bridges crossing the river were destroyed; and the gas-pipes there, and in many other parts of the town, were completely lost. The gas-works were flooded, and the Engineer (Herr L. Wallmuhler) and his family were with difficulty rescued from their falling house by the fire brigade. The gasholder tank was broken away by the impact of trees and *débris* carried down by the flood; and the gasholder bell finally heeled over, and only small traces of it were subsequently found. The outlet main from the works was washed away for at least 150 yards; and no traces of the pipes have yet been observed. The foundations of the retort furnaces resisted the flood and protected some of the apparatus. "Der Gastechniker" publishes an extensive list of subscriptions raised for the benefit of the Engineer of the ill-fated works.

PERSONAL.

Mr. J. Leach, the Deputy Town Clerk of Rochdale, has been promoted to the position of Town Clerk, held for so many years by Mr. Zachary Mellor, whose death was recorded in the "Journal" last week.

Mr. J. P. Hallaway, an assistant to Mr. C. B. Newton, Assoc.M.Inst.C.E., F.C.S., at the Carlisle Gas and Water Works, has been selected to fill the position of Assistant to the Colombo Gas and Water Company, Limited—an appointment which was advertised in the "Journal" for the 3rd ult. He will leave England next month to enter upon his duties.

An interesting presentation recently took place at the Stockton-on-Tees Corporation Gas-Works. Mr. Herbert K. Kindler, the chief assistant to Mr. W. Ford, the Engineer and Manager, was the recipient of a purse of gold, a hall table, and a set of ornaments from the employees, on the occasion of his marriage, as a token of their esteem. Mr. Ford made the presentation, and spoke very highly of the ability of Mr. Kindler, and of the manner in which he had filled different positions at the works during the past fourteen years.

The Council of the Institution of Civil Engineers have awarded a Telford Medal and Premium to Mr. T. Holgate, Assoc.M.Inst.C.E., the Gas Engineer of the Halifax Corporation, for his paper on "The Enrichment of Coal Gas," contributed to the Proceedings of the Institution for the past session, and now under notice at some length in our columns. A similar award has been made to Mr. H. A. Humphreys, Assoc.M.Inst.C.E., for his paper on "The Mond Gas-Producer Plant and its Application," an abstract of which appeared in the "Journal" for March 23 last.

OBITUARY.

After only a few days' illness, Mr. W. Lester, J.P., of Wrexham, the Vice-Chairman of the Brymbo Water Company, died on Monday of last week. The immediate cause of death was pneumonia.

We regret to announce the death last Tuesday of Alderman R. B. Fenwick, J.P., in his 62nd year. Deceased was a Director of the East London Water Company and of the Mitcham and Wimbledon Gas Company, and an Alderman of the Surrey County Council.

The death is announced of Mr. G. W. Harrison, who, until recently, was Manager of the Aberavon Corporation Gas-Works, which appointment he resigned owing to ill-health. The deceased, who was greatly esteemed in the town, leaves a widow and young family.

"Der Gastechniker" announces the death, on the 15th ult., of Herr Carl Munder, who for 28 years was Manager of the Gas Company at Agram, the capital of Croatia. He was born near Stuttgart in 1842; and for a few years prior to receiving the Agram appointment he managed the gas-works at Eichstädt, in Franconia.

Alderman Robert Shaw Buckley, of Mossley, died suddenly on Sunday, the 19th inst. The deceased, who was extensively engaged in the cotton-spinning industry, had been twice Mayor of Mossley, and was a Justice of the Peace for the borough and for the West Riding of Yorkshire. He was an active member of the Joint Water-Works Committee of Ashton, Stalybridge, Dukinfield, and Mossley, and rendered valuable service in the inception and carrying out of the water scheme.

NOTES.

The Standardizing of Incandescent Electric Lamps.

Dr. Louis Bell presented, at the recent Convention of the (American) National Electric Light Association at Niagara, a report upon the standard candle power of incandescent electric lamps, which contains some interesting and suggestive points. The report covers three primary considerations relative to the standardizing of the illuminating power of incandescent electric lamps—the determination of the standard of light; the application of such standard to the testing of lamps; and the specification of a normal standard of luminosity for commercial electric lamps. It appears that the preference for a standard of light fell upon the Hefner-Alteneck amyl-acetate lamp, used with a Lummer-Brodhun photometer screen. It was recommended that in photometrically testing electric incandescent lamps, they should be revolved upon a vertical axis at the rate of about two revolutions per second; the result being taken to represent the mean spherical illuminating power. Unfortunately, neither the amyl-acetate standard of light nor the photometer in question is suitable for rapid work, so that the intervention of secondary standards is necessary. It is further suggested that the fairest way of measuring an incandescent electric lamp, in order to arrive at its spherical illuminating power, would be to tilt it at an angle of 45° with the vertical, and then spin it slowly. It is recognized, however, that the exact determination of the illuminating power of a lamp is pedantry, and that practical justice is best attained by enjoining that certain limits should be observed, rather than requiring an exact candle power. Thus for a 16-candle power lamp, measured obliquely as

already described, a minimum of 15-candle power and a maximum of 17-candle power are regarded as being fair to all parties concerned. Any lamp the efficiency of which lies between these limits, is therefore classified as a 16-candle power lamp.

Valving a Water-Main Under Pressure.

An operation of a novel character, consisting in cutting out a piece of a 6-inch water-main and putting in a valve without stopping the flow of water, is described in the "Engineering Record." It was performed on a main of the Hackensack Water Company, by means of a device invented by Messrs. M. R. Sherrard and D. W. French, respectively the City Engineer of Newark and the Superintendent of the Water Company. A water-tight cast-iron chamber was fixed round the main. The chamber was made in two storeys, so to speak; the lower being separated from the upper by a diaphragm in which a sort of lock-slide was contrived. A double pipe-cutter was the furniture of the lower portion of the chamber, worked from outside by means of a rod passing through a stuffing-box in the casing. When the section of pipe was cut out, it was held by the cutters, and with them lifted into the upper portion of the chamber, after which the lock-slide was shut. Thus the open ends of the main communicated with each other through the box, which was full of water under pressure. The cutters and piece of pipe being removed from the upper portion of the chamber, the valve intended to be fixed upon the main was placed in position for lowering into its place after the upper chamber had been again closed and the lock-slide opened. The lowering was easily effected by a screw working through a stuffing-box; and when the valve was in place, a couple of sleeves with indiarubber caulking-rings were by similar means pushed or pulled over the joints. The whole operation was successfully carried out on the first attempt; and machines are now being made for dealing in the same way with water-mains up to 12 inches in diameter.

The Unification of International Tests of Materials.

In 1884, the late Professor Bauschinger, of Munich, had the idea of bringing into personal contact the numerous professional men of all countries who were engaged in the work of testing materials of construction. It was perceived that here was an opening for promoting "internationalism" which offered imposing possibilities; for such things as portland cement and steel are of no nationality. Congresses were accordingly held at Munich, Dresden, Berlin, Vienna, and Zürich; and at the last meeting it was decided to form a permanent International Association, having for its laudable object the unification of methods of testing structural materials. The Association now numbers 1200 members; and it held its sixth International Congress last month at Stockholm, under the presidency of Professor Tetmajer, of Zürich. Great Britain was represented at the congress by Mr. Bennett Brough. Among the papers read, were some advocating the adoption of an international specification for structural iron and steel. As an accessory to this plan, the establishment of an international iron and steel testing laboratory was advocated by Dr. H. Wedding. It transpired that a promising start towards the foundation of such an establishment had actually been made. A competent Director has been found in Baron Jüptner; and ample accommodation has been granted at Zürich by the Swiss Government. Subscriptions towards the cost of maintenance for ten years have been promised by some of the large British and Continental ironworks; and it is intended to begin operations next January. The whole of the Council of the Iron and Steel Institute have joined the Association; and in future the proceedings of the congress will be published in English, as well as in French and German.

The Westinghouse Gas-Engine.

At last, according to an American source, the Westinghouse gas-engine is an accomplished fact. It has been rumoured for years that the Westinghouse interest was concentrated upon the endeavour to develop the potentialities of gaseous fuel; and now it appears that the effort has culminated in a marketable gas-engine, which the Company are prepeared to sell in all sizes from 5 to 500 horse power. The new gas-engine is very similar in appearance to the Westinghouse steam-engine, with which it is declared to be mechanically equal. In the smaller sizes of the Westinghouse gas-engine, there are two cylinders; and in the larger sizes, three cylinders—all of trunk pattern. The gaseous mixture is ignited electrically, which does not strike a critic as being a particularly desirable feature of any gas-engine. With the larger engines of the class, starting is effected by means of compressed air. An air-compressor and compressed air storage reservoir are provided; and by an ingenious arrangement one of the engine cylinders is temporarily convertible into a compressed air motor. By this means, the engine starts and runs as a compressed air engine, until the regular gas-engine cycle is set up in the other cylinder. This process is strictly automatic. The engines are stated to be constructed in the highest style of mechanical engineering, and of the best materials; and the arrangements for governing, lubricating, and dealing with wear of the moving parts are in accordance with the ordinary steam-engine practice of the firm. The Westinghouse gas-engine is a workmanlike looking machine, and may prove efficacious in winning more acceptance in the United States than has been accorded to the Otto engine.

COMMUNICATED ARTICLE.

THE SALE OF SULPHATE OF AMMONIA.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

The low prices current for this residual during the spring and summer, have not attracted so much attention in gas circles as one might expect; and the reason is not far to seek. In most cases, the low return under the heading of "Sulphate" is the only unsatisfactory feature in a fair and prosperous state of affairs, as exhibited by the statutory statement of accounts. Coal and other materials have been moderate in price. The demand for gas—thanks to the good offices of slot meters and incandescent burners—shows a steady and substantial increase. Tar is better; and coke is looking up. In the midst of so much genuine cause for congratulation, it is a natural thing to look indulgently on the sulphate item, and to accept it in a matter-of-fact philosophical sort of spirit. We cannot expect everything to wear a rosy hue, and should be grateful that there is nothing worse to bear. This appears to be the prevalent tone at shareholders' meetings; and the question of the means adopted for the advancement of other manurial agents, though to some extent at the expense of sulphate, and the various tactics in the way of rigging the market with a view of making a good thing in this particular article—in respect to which we must remember that neither producer nor consumer, to use an Americanism, comes in at the divide—has been regarded with comparative indifference, so far as the gas industry is concerned.

But sulphate of ammonia is also a product in connection with other branches of applied chemical engineering, and as such appears to take a more important position than it does in the eyes of the gas engineer. The makers are not inclined to stand on one side and see sulphate crowded out of the market without a show of resistance. While the gas engineer, in many instances having other more pressing matters claiming his attention, is inclined to sell at any price buyers like to offer—a fact that has been used to his disadvantage—we find that others are devoting some attention to the intrinsic value of sulphate, the reasons that have led to the depression of the market, and generally to the why and the wherefore of the whole thing. The same has been done, in a more or less spasmodic manner, in connection with the gas industry from time to time, but has been dropped because no one seems to have time to properly handle it. The results of this later inquiry are the same as in former cases. We are again told that ¾ cwt. of sulphate is equal in manurial value to 1 cwt. of nitrate; that it is not so soluble in water, and will not be washed into the ditch with the first rain; and that it is not deliquescent, and is therefore well adapted for use as the nitrogenous element in the preparation of fertilizing mixtures. To this might be added a feature that would attract more attention in any other country than our own, but which nevertheless should be appreciated by all interested in the general commercial prosperity. While in other lands the manufacturer of a home product is encouraged, and can look to his Government for support in many ways, in England he is a kind of football, to be kicked about and worried by tax and rate collectors, inspectors, and railway companies; and the same feeling spreads to purchasers in need of his commodities. It has been proved over and over again that the bulk of the sulphate made in this country ought to be delivered directly into the wagons of neighbouring farmers, and that the cost of cartage incurred on it need be no more than is sufficient to convey it into the next parish. But the fact of the market prices, and of our dependence upon foreign users who are beginning to find that supplies can be obtained nearer home, remains with us. Once more is surprise expressed that the German or the French agriculturist should be willing to pay the carriage on a product that the British farmer does not care about, although manufactured at a works within a stone's throw of his own door; and there is a general impression that something ought to be done in the way of remedying such a state of affairs.

The prevailing idea seems to trend towards a kind of Central Committee, who should publish suitable literature, offer prizes for essays, encourage experiments of a practical nature, and generally advertise the thing. Something has already been done under the first head; and several pamphlets or leaflets have been published for the use of makers. So it is pertinent to ask: "Is the issue of pamphlets sufficient of itself?" Also: "Is it the best plan to issue the same by post or otherwise, from the office of the gas company?" We must consider whether it is consistent with the farmer's customs and methods of doing business, to expect that he is to be influenced by this means. To begin with, the pamphlet form of advertising is so largely used now, that the sulphate leaflet runs a chance of being smothered amid a host of others. Few of us could honestly say that we take every pamphlet left by the postman at our door, and carefully peruse and digest it from the beginning to the end. Without any great stretch of imagination, we may suppose a farmer sitting down to peruse a sulphate leaflet—probably at a time when he is too much used up with regular work to bestow a fair amount of attention upon it—and after a casual glance at its contents, casting it aside without further thought; regarding the experiments quoted in the same light as the average householder looks at the scientific (?) facts in a

patent food or universal medicine circular. Again, let us put the collar on the other horse, and suppose that a gas engineer receives by post some leaflets sent by a farmer, dealing with some agricultural residual that is applicable for purifying gas, and quoting practical experiments, together with some practical advice. Might it not have a similar effect to that exercised upon a wealthy and successful farmer, who cast a sulphate leaflet into the fire after perusal, with the remark that he had farmed for 30 years and knew what manures to use without taking the advice of a gas company in the matter?

There is a modern type of farmer coming on with the rising generation, who has been through his courses at a college of agriculture, and understands analytical chemistry and the constitution of soils and manures. But the average agriculturist is steady going and old fashioned; having a sturdy scorn for new-fangled notions, and not likely to be of a pamphlet-reading turn of mind. A common feature of the regular newspaper testimonial, is the statement that the writer's attention was first attracted by "reading your pamphlet;" but I question whether many gas companies can say the same in connection with the sale of sulphate. The part played by instructive literature is secondary, rather than primary. Sell the farmer a sample lot of sulphate *first;* and then the chances are that he will accept and study the leaflet, which previously he had cast aside in a casual way. I would also question whether attempts to combine advertisement with instruction, in the shape of a pamphlet endorsed with the name of the vendor in bold type, or with prices, are a success. The fact of a man having "something to sell" does not increase one's confidence in his utterances; and, in a similar manner, the glaring advertisement is likely to detract from the value attaching to the contents. If it is decided to issue pamphlets, they should be anonymous, or at any rate carry nothing further than "With the —— Gas Company's compliments." The pamphlet is a useful servant in connection with the second or following orders, but not of much use as regards the first.

But suppose that one of the arrows shot at a venture, in the shape of the pamphlets sent out by the medium of Her Majesty's mails, happens to hit the mark—that the farmer reads the pamphlet and is impressed by it. We are repeatedly told that the average agriculturist knows very little about the composition of manures, and depends to a greater or less extent upon the advice of the vendors of artificial fertilizers. What is more likely than that he will take it to the agent or representative from whom he is in the habit of purchasing manures and feeding stuffs, and ask for his opinion. The salesman has not had sulphate put upon his list of wares. He has heard casually that people go to the gas-works to buy it; or perhaps he finds on the front page of the pamphlet the announcement "To be obtained of the —— Gas Company." As a business man, his mind naturally leans to the little commissions which he has turned over on the querist's orders from time to time, to the fostering and increase of which his energies are directed; and his reply is more likely to tend towards getting an order for one of the items entered on his own trade list, than in the direction of inducing the customer to send elsewhere for some sulphate. And if, while booking the order, he makes a witty reference to "chemical stuff" or "gas-works refuse," we need not be surprised.

A great deal is said about the success of a certain Committee in connection with nitrate of soda. No doubt they have freely advertised it, boomed it, kept together a connection, and added thereto. But I question whether they have secured many direct orders. This is an important point; and the distinction between the two must be carefully made. I do not think that any Committee will be likely, by means of pamphlets or otherwise, to influence direct sales from producer to consumer, to anything like a general extent. A small proportion of business may be thus obtained; but the bulk will continue to be done over the counter at the shop, or at the desk of the agent who attends regularly at the market. Without doubt the prize essays, the advertisements direct and indirect, and the pamphlets have all assisted in keeping nitrate well in front of the agricultural public. I do not decry the value of these means, but regard them as crutches rather than as main supports. The general opinion seems to follow the idea that the vendors may go thus far, and then sit down and wait for orders to drop in.

But turn for a minute to the actual way in which business is done. It is market day; and the farmer arrives at the usual hour, and at once proceeds to buy and sell stock or produce. This occupies him up to the time of the one o'clock ordinary. After dining he has a quiet chat with his neighbours about business and other matters, but chiefly business. At this period, he may possibly hear something about sulphate. He decides to try a sample lot, and goes out to buy some. There is a man round the corner who will book orders for several other manures; but it is not likely that he knows anything about sulphate. The would-be buyer may search the market through without being able to place his order—and yet a stock of some hundred tons is held within a few miles. This is not fancy, but is founded on actual fact. For ten years a farmer who attended market regularly, and knew all that was going on, was accustomed to send fifty miles for supplies of sulphate, and actually did not know that it was on sale within two miles of his farm. Only recently a well-known Professor of Agriculture, in the course of a technical magazine article, referred to sulphate offered at £7 10s. as too cheap to be genuine. Another farmer was under the impression that sulphate was listed at about £15; and on being told that he could get it for less than £10, he at once cheerfully placed a large order, and wished he had known it before. These are plain facts; and several more of like kind could be quoted.

I do not deny that well-written leaflets or pamphlets—not too prosy, not too long, and not too scientific—have secured some business, and especially if based more on the lines of popular advertising than on a chapter or extract from a heavy science work of eight or nine volumes. But this quasi-scientific preaching at the farmer, which has been conducted off and on for some time now, will never reach the bulk of possible purchasers. The seller of sulphate must come down from the platform, where he has been talking well over the heads of the majority of his audience for some years past, and go in and out among the agriculturists. Sulphate must get before the farmer's observation in the regular business way; for farmers, more perhaps than any other class, like to follow their established habits and traditions. It must be quoted on all the trade lists, and be present in every box of samples. Placards relating to it must get in among the coloured prints of enormous carrots, gigantic turnips, and Brobdingnagian swedes that embellish the walls of the seed and artificial manure shop; and the pamphlets may be at hand on the counter for the use of all who want them. Agents of experience and influence, knowing when and how to approach the purchaser, must be at every corner of the street, sitting at the table of every market ordinary, in the smoke-room at the farmers' club, at every horse or cheese show, at the exhibition of agricultural implements, and everywhere else where there is a chance of getting orders. *This is the secret of the success of nitrate.*

Further, I prefer to utilize the experience of existing agents—wherever it is available—rather than send out new ones, who must necessarily be under a disadvantage as compared with those who know the ground. There is no occasion for the sulphate maker to sit, like Micawber, waiting for something to turn up in the shape of some wonderful Committee that, after being pulled this way and that amid a multitude of counsellors, will come out in grand form and do the whole trick for him. Let the disconsolate holder of a large stock arm himself, first, with a fair analysis of his product, made by some leading Professor of Agriculture or Analyst, who is well known and regarded as an authority in the district that is to be exploited. This, by the way, is a helpful course under any circumstances. A few copies should always be at hand in the rental-office. The next thing is to obtain copies of published pamphlets or leaflets, and to put up a few neat sample bottles. A morning's work on a quiet day, using the word from the agriculturist's point of view, will do the rest. Thus prepared, he selects a few of the leading agents in the neighbourhood, interviews them personally, putting the matter before them in the usual business way. The analysis, the samples, and the literature are all discussed, the agent's opinion is taken on the matter of advertising, and so on. Arrangements are made for the supply of placards, pamphlets with trade address, &c., as may be required. The exact course to be taken must vary according to local circumstances. Perhaps an advertisement giving a list of dealers may be inserted in the local paper. But while the means may differ, the end desired is the same. We want, through the medium of the agent, to get close to the farmer in a business-like way, at business hours, and in accordance with his particular habits and ways of doing business. In this manner, a local connection may be established that will relieve the maker from any anxiety respecting market prices and stocks.

But this is in addition to, and not as a substitute for, the work of the Central Committee. If every maker of sulphate was to act on this advice, the need for the Association would not be reduced one iota. On the contrary, a demand for pamphlets, for literature, and for the results of experiments would be created. Where the prize essay, if published to-day, would find one reader, it would then find one hundred. I can even imagine that a well-written text-book, embracing the gist of the published information, would find a ready sale. If anything, double the subscription to the Association, and do not think of dropping it.

TECHNICAL RECORD.

NOTES ON THE ENRICHMENT OF COAL GAS.

(*Continued from p.* 633.)

Enrichment by Oil Gas.

The manufacture of oil gas on an extensive scale, for the purpose of enriching coal gas, is a modern development of the gas industry, though oil gas has for years been made in large quantities for other purposes. The processes of manufacture used by the compressed oil-gas companies for the production of gas for the lighting of railway carriages, buoys, &c., have not been found very suitable for adoption at ordinary gas-works; and the manufacture of oil gas for enriching purposes is now generally carried out by the so-called Peebles process, which is a recent development. Perhaps the greatest advantage of this system from the gas engineer's point of view is that by it any description of oil may be gasified without difficulty, and

without blocking of the apparatus. Other important points in its favour are the absence of tarry residues, and the formation of a small quantity of coke, which is readily marketable, in their stead. Since the description of oil used does not affect the details of working of the process, but only the quantity and quality of the coke and gas produced, it will be convenient first to refer briefly to the system itself.

The important patent covering the process is No. 12,421 of 1892*; and the patentees were Messrs. W. Young and A. Bell, of Peebles, N.B. The process has been frequently described in these pages. Among the most valuable descriptions of it are the following: By Professor V. B. Lewes†; by Mr. A. Bell, junr.,‡ with illustrations of the plant erected at the Galashiels Gas-Works; by Mr. S. Glover,§ with illustrations of plant erected at the St. Helen's Gas-Works; and by Mr. A. Waddell,‖ with an illustration of the plant erected at the Broughty Ferry Gas-Works. Mr. T. Holgate, in his recent communication on enrichment to the Institution of Civil Engineers, took the Galashiels plant as a type of the Peebles system; and the illustration which accompanies his paper is similar to the lower one on p. 265 of Vol. LXII. of the "JOURNAL." It is unnecessary now to describe the plant and the method of working, since the many recent descriptions have made readers perfectly familiar with both. Apart from constructive details, the essential points of difference between the Peebles and most other oil-gas processes are the following.

The temperature of carbonization of the oil is lower than was customary hitherto. It has been stated by Professor Lewes to be about 1650° to 1750° Fahr.; whereas other oil-gas retorts are frequently heated to 2000° Fahr. and upwards. An incidental advantage of the low temperature of carbonization is that the waste heat from coal-gas retorts suffices to heat the oil-gas retorts; and in the Galashiels installation already referred to, the oil and coal retorts are placed back to back, and the products of combustion from the coal-gas setting heat the oil-gas retorts. In that case, however, the working temperature inside the retort is only from 900° to 950° Fahr.; while the exterior of the retort is from 1200° to 1300° Fahr. For the higher temperature mentioned by Professor Lewes, there is no doubt that direct firing would become necessary; but apparently the patentees did not anticipate that many samples of oil would need so high a temperature of carbonization. It may be taken for granted that the temperature which gives the best results for a particular oil by the Peebles process is lower than that at which such oil would have been gasified by earlier systems. The relation which should subsist between the temperature of carbonization and the description of oil, will be considered later. The next essential point of difference between the Peebles process and earlier systems is the method introduced in the former of scrubbing the gas produced with fresh oil, which absorbs the hydrocarbon vapours and some of the gases. The gas which survives the scrubbing by oil, is free from readily condensable vapours. The oil used in the scrubbers is subsequently carbonized; and the vapours, &c., washed from the gas are thus returned to the retorts to be converted to less readily condensable gases. At intervals, the tar or thickened oil which collects in the retorts is completely carbonized to coke by interrupting the supply of oil; and the coke is drawn from the retorts. Thus the oil vapours are returned to the retort until they are wholly converted into coke and a gas of which the constituents are insoluble, or but sparingly soluble, in oil.

The process consistently carried out to this end, is somewhat wasteful of energy, in that the constant return to the retort of matter which has been previously imperfectly treated therein expends heat rather prodigally, and restricts the output per retort. In instances where it is primarily necessary that the gas should be quite free from vapours condensable under any probable contingency, the process may not ultimately prove wasteful of energy; but in the ordinary case of enriching coal gas by a few candles, it has been found that a departure from the original scheme of the Peebles process is fraught with economy. Mr. S. Glover observed that certain volatile hydrocarbons were continually returned to the retort, and escaped decomposition. He found, however, that the admission to the hydraulic main of the oil retorts of a small proportion of coal gas, sufficed to carry forward these volatile hydrocarbons, and to retain them in the gas. The effect of their retention was a higher illuminating duty from the oil, and an increased make per day per retort. Another suggestion which has been made with a view to increasing the economy of the Peebles process, is that the gas should be less severely washed by the oil, so that more vapours may pass forward in it, instead of being returned with the oil to the retort. There is no doubt that, for a small degree of enrichment of coal gas, it is quite unnecessary to adhere rigidly to the thorough washing of the oil gas, which is the chief characteristic of the Peebles system of manufacture. The introduction of coal gas into the hydraulic main of the oil retorts, is said to increase the duty obtained per gallon of oil from 1600 to 1800 candles; and therefore it may be surmised that the oil vapours retained by the coal gas are illuminants of a higher grade than the ultimate products of their destructive distillation. If by any means such vapours can be safely used for the enrichment of coal gas, an economy over enrichment by less readily condensable vapours or gases is certainly achieved.

In order to assess rightly the value of Peebles oil gas as an enriching medium, it is necessary to regard its composition. Analyses have been published by Professor Lewes as follows:—

	I.*		II.†
Hydrogen	16·85	..	16·85
Unsaturated hydrocarbons	44·83	..	43·83
Saturated hydrocarbons (Ethane)	17·30	..	36·30
Saturated hydrocarbons (Methane)	19·00		
Carbonic acid	0·63	..	0·63
Oxygen	0·24	..	1·14
Nitrogen	1·15	..	1·25
Total volume	100·00	..	100·00
Description of oil from which the gas was made	Blue oil sp. gr. ·850	..	·850
Make of gas per gallon of oil, cubic feet	85·0 (?)	..	100·0 (?)
Illuminating power of the gas when consumed alone	Candles 50–60	..	60

There are resemblances between these analyses which almost preclude the possibility of their having been made independently. But the curious fact that the proportions of *three* constituents are slightly different in the two cases, while the total volume in each example is 100, almost equally prevents the conclusion that they are one and the same analysis varied in the course of transcription or printing. Whatever be the explanation, the resemblance is so close that only one set of figures need be considered here. The most striking fact is the nature of the illuminating constituents. It has been stated that the large proportion of unsaturated hydrocarbons consists mainly of ethylene; and in several statements it has been implied that benzene and other aromatic hydrocarbons occur in very small amount in, or are absent from, the finished gas. Then there is a large proportion of saturated hydrocarbons; and in one set of figures, these are described as ethane and methane. Seeing that there are analytical difficulties in the way of determining the respective volumes of the several paraffins when there are more than two in a mixture, and that the heavier members of the series would be removed by the washing process to which the gas is subjected, the differentiation into the two lowest members of the series is perhaps justified. It must, however, be remembered that the sharp distinction between methane, ethane, and the next higher members of the paraffin series which the first analysis indicates, could not be found to obtain in any commercially produced gas; and that the true meaning of the figures is that there is in the gas 36·3 per cent. of saturated hydrocarbons, of which not less than 19 per cent.—or rather more than half—will be methane. A consideration of the percentages of the hydrocarbons of the two series, and of their relative values as illuminants, leads to the conclusion that at least 75 per cent. of the illuminating power of the Peebles oil gas is probably due to the ethylene and other light olefines in it. The inference is that the luminosity will not be appreciably affected through exposure of the gas to cold, since ethylene and the next olefines are gaseous at all ordinary temperatures. As a reliable enriching medium under all conditions, Peebles oil gas, therefore, is unsurpassed.

The question naturally arises whether it is truly economical of material to produce gas of the composition of Peebles oil gas for the enrichment by a few candles of coal gas. It has been indubitably proved that paraffins and olefines are poor illuminants, compared with certain aromatic hydrocarbons; and it has also been demonstrated that coal gas can safely carry more than sufficient of the latter to give it the necessary enrichment by a few candles. Therefore there is a considerable latitude in favour of the production of aromatic hydrocarbons, if the highest available illuminating value be sought of the raw material. The Peebles process aims at producing other and feebler hydrocarbons only; and for the enrichment of coal gas by a little merely it has been a success, because the more difficult problem of producing commercially a gas containing benzene in place of (say) ethylene, has not hitherto been attacked by so successful workers as Messrs. Young and Bell. For high-candle power gas, benzene cannot be relied upon as an enricher; and the Peebles gas stands almost without a rival. These notes do not, however, treat of high degrees of enrichment; and the peculiar fitness of the Peebles process for such a case is therefore mentioned in passing. The fault of the Peebles system, from the point of view of the gas manager who seeks the cheapest enrichment of coal gas by a few candles, is that it fails to take advantage of the superior illuminating value of hydrocarbons of the benzene series. These are produced only in small quantity at the low temperature of carbonization; and when formed, they are washed back to the retort. It is not surprising, therefore, that certain modifications of the original process, which tend to preserve in the gas vapours of benzene and other readily condensable hydrocarbons, have been found by Mr. Glover to give a higher duty from the oil than did the original system itself. Such modifications, rationally designed and matured, are likely to add greatly to the illuminating duty obtained by this process from the oil.

Many estimates of the cost of enrichment by Peebles oil gas have been published. The cost of plant, including all accessories, has frequently been stated to be the same per 1000 cubic feet as for coal gas; but other estimates make it less. The

* See "JOURNAL," Vol. LXII., p. 169.
† *Ibid.*, Vol. LXI., p. 1151. ‡ *Ibid.*, LXII., p. 265.
§ *Ibid.*, Vol. LXIII., p. 1050. ‖ *Ibid.*, Vol., LXVI., p. 335.

* See "JOURNAL," Vol. LXI., p. 1151. † *Ibid.*, Vol. LXIII., p. 385.

storage and purifying room required is considerably less than for coal gas, and other requirements appear to be nearly the same. So it is perhaps fairer to assume, with Mr. Holgate, that the cost of the Peebles oil-gas plant is £10 per 1000 cubic feet, against £14 for coal-gas plant—omitting the outlay for land in both cases. There is a royalty of 2s. 6d. per ton of oil carbonized by the process. Wages amount to about the same as for coal gas; but the expenditure for fuel is greater. The chief item in the cost of the gas is the value of the oil, which varies very much according to the position of the works. Mr. Holgate and Mr. Glover have reckoned £3 7s. 6d. per ton for suitable shale oil, delivered at the works at Halifax and St. Helens; whereas Mr. Yuill was able to buy it for £2 3s. 6d. at Alloa.* The price charged in London and many other towns would generally be lower than the former, but higher than the latter figure; and therefore an estimate of the cost of the gas with oil at 2½d. per gallon is given in the last column of the appended table. The coke produced amounts to about 5 cwt. per ton of shale oil, and realizes about £1 per ton. The first four columns of the table are from published estimates; but figures marked with an asterisk have been added, in order to make the conclusions comparable with one another.

Cost of Oil Gas by the Peebles Process.

Authority	Mr. T. Holgate.	Mr. S. Glover.	Mr. A. Yuill.	Mr. A. F. Browne.	—
Place	Halifax.	St. Helens.	Alloa.	London.	—
Specific gravity of oil used	·875	·865	·865	—	·870
Make of gas per ton of oil, cubic feet	22,000	22,000	22,838	—	22,500
Enrichment value of gas, candles	90	95	97·2	90	95
Pounds of sperm per ton of oil	6789	7241	7611	—	7329
Cost of one ton of oil	£3 7 6	£3 7 6	£2 3 8	—	£2 13 8
Royalty per ton of oil carbonized	0 2 6	0 2 6	0 2 6	—	0 2 6
Cost of fuel, do. do.	0 2 6	0 5 0	0 5 0*	—	0 5 0
Wages, capital charges, &c., per ton of oil carbonized	0 5 10	0 5 10*	0 5 10*	—	0 5 10
Value of coke obtained per ton of oil	£3 18 4	£4 0 10	£2 17 0	—	£3 7 0
	0 5 0	0 5 0	0 4 6	—	0 5 0
Net cost of the gas from one ton of oil	£3 13 4	£3 15 10	£2 12 6	—	£3 2 0
Cost of 1000 cubic feet of the gas	0 3 4	0 3 5½	0 2 3½	£0 3 9	0 2 9
Cost of 1000 cubic feet per candle enrichment value	0·444d.	0·431d.	0·284d.	0·5d.	0·345d.

It will be observed that the oil gas has been credited with its enrichment value as ascertained empirically, instead of its photometric value when consumed alone. Since there is considerable difference between the two values in the case of this gas, it is fair to it to credit it with the enrichment value; but in comparisons of the cost of Peebles oil gas and other enriching gases, the latter should be also credited with their enrichment value when that differs—as it generally does—from the photometric value directly observed. From the figures for the cost of the oil gas, the cost of enrichment by its aid may be calculated. The estimates given below for Halifax and London are from Mr. T. Holgate's and Mr. A. F. Browne's calculations. The third estimate is based on the figures in the last column of the above table of the cost of the oil gas, and therefore refers to oil at 2½d. per gallon.

Cost of Enrichment by Peebles Oil Gas.

	At Halifax. d.	In London. d.	— d.
Cost per 1000 cubic feet of—			
15-candle coal gas	9·000	12·00	12·000
Oil gas, 90 candles enrichment value	40·000	45·00	·—
" " 95 " " "	—	—	33·000
17-candle mixed gas	9·828	12·88	12·525
Cost of 2 candles enrichment per 1000 cubic feet	0·828	0·88	0·525
Cost of enrichment per candle per 1000 cubic feet	0·414	0·44	0·262

The Peebles system of oil-gas manufacture has undergone modification at the hands of Mr. W. Young, in order to adapt it to internal heating of the retorts, and simultaneous production of water gas and oil gas. This modification will be referred to again in the portion of these notes dealing with carburetted water gas. There is another system of enrichment by oil gas, which has been tried at the Huddersfield Gas-Works. It is enrichment by the so-called oxy-oil gas, which is manufactured according to the inventions of Messrs. Caldwell and Tatham.

The apparatus used for the production of oxy-oil gas at Huddersfield has been fully illustrated in these pages*; and an abstract of Messrs. Caldwell and Tatham's patent specification covering this special form of apparatus has also been given in the "Register of Patents,"† together with an illustration of the apparatus. Mr. Holgate gave illustrations similar to some of those in the "JOURNAL," when describing the oxy-oil gas process in the course of his recent communication to the Institution of Civil Engineers. His description and information are from Mr. W. R. Herring's work, which has been reported in these pages from time to time. Earlier investigations on the oxy-oil process were described by Dr. L. T. Thorne in a paper read before the Southern District Association of Gas Engineers.‡ To these sources, readers who are unacquainted with the details of the process are referred. Much controversy at one time waged over the merits of oxy-oil gas; and the disputants waxed warm, as back volumes of the "JOURNAL" testify. The only important results of the working of the process have been obtained at Huddersfield; and Mr. Herring's accounts of the work there are virtually the only information of value concerning it. Mr. Holgate quotes them freely, and refrains from criticism. Seeing that the criticism of those who have not actually worked the oxy-oil plant has been resented in the past, a very similar attitude to that of Mr. Holgate will be taken towards the system in these notes.

* See "JOURNAL," Vol. LXIII., p. 1055.
† *Ibid.*, Vol. LXIV., p. 331. ‡ *Ibid.*, Vol. LXII., p. 982.

The oil is admitted to each retort in the two upper of the four rows constituting a setting, through a 2-inch tube passing through the heated portion of the retort. The retorts are at a dull red heat, such as will give a canary-coloured gas. The retorts in the bottom row are hotter, and are used for carbonizing the tarry liquid which condenses in the seals. The lighter oil thrown down in the condenser is returned, mixed with fresh oil, to the retorts of the next higher row. The gas from the whole of the retorts of each setting is mixed in the collecting main above the setting with about 15 per cent. of its volume of oxygen. The mixture is the oxy-oil gas, which is added in the required proportion to the coal gas which needs enrichment before the latter enters the purifying plant.

The following are estimates of the cost of producing oxy-oil gas. No. 1 is compiled from the particulars of four months' working of the plant given by Mr. Herring.† No. 2 is given on the same authority by Mr. Holgate from twelve months' working; and No. 3 is a similar estimate, in which the oil is assumed to cost only 2½d. per gallon. The illuminating power of the oxy-oil gas burnt in a No. 00 Bray burner, is equivalent to 70 candles under standard conditions.

Cost of Enrichment by Oxy-Oil Gas.

No. of estimate	1	2	3
Specific gravity of oil used	·878	·878	·878
Cubic feet of oxy-oil gas made per ton of oil	27,433	27,285	27,285
" " oxygen used " "	4,115	4,080	4,080
Pounds of coke made per ton of oil	93	90	90
Enrichment value of the oxy-oil gas, candles	116	126	126
Cost of one ton of oil	£3 7 6	£3 7 6	£2 13 2
Wages and purification charges per ton of oil	1 2 0	0 14 6	0 14 6
Cost of fuel per ton of oil	0 6 11	0 2 6	0 2 6
Cost of oxygen used per ton of oil	0 18 6	0 18 4	0 18 4
Royalty do.	0 6 10	0 5 0	0 5 0
Capital charges, wear and tear, &c., do.	0 5 2	0 2 4	0 2 4
Gross cost of carbonizing per ton of oil	£6 6 11	£5 10 2	£4 15 10
Value of coke produced per ton of oil	0 0 10	0 0 9	0 0 9
Net cost of gas made per ton of oil	£6 6 1	£5 9 5	£4 15 1
Cost of 1000 cubic feet of the gas	£0 4 7	£0 4 0	£0 3 6
Cost per 1000 cubic feet per candle enrichment value	0·475d.	0·381d.	0·332d.

	Halifax. d.			London. d.		
Cost per 1000 cub. ft. of—						
15 candle coal gas	9			12		
Oxy-oil gas, 116 candles	55·150	..	..	55·150	..	..
" " 126 "	..	48·000	41·800	..	48·000	41·800
17-candle mixed gas	9·910	9·700	9 590	12·860	12·650	12·540
Cost of 2 candles enrichment per 1000 cub. ft.	0·910	0·700	0·590	0·860	0·650	0·540
Cost of enrichment per candle per 1000 cub. ft.	0·457	0·351	0·295	0·427	0·324	0·268
Taking the cost of oxy-oil gas according to estimate No.	1	2	3	1	2	3

* See "JOURNAL," Vol. LXIV., p. 235. † *Ibid.*, Vol. LXIII., p. 1057.

The results given in this table compare favourably with those of other oil-gas systems. So far, however, the oxy-oil gas system of enrichment does not appear to have been extensively used except at Huddersfield. It has been suggested that the oxygen might be replaced by a combustible gas—such as coal gas—with equally good results. The value of the oxygen is undoubtedly in part due to the increased volume of gas capable of becoming saturated with hydrocarbon vapours which it provides; and other gases would serve this purpose. It has been contended that the presence of oxygen in the gas only improves the illuminating power when the gas is burnt without considerable dilution with coal gas. It has also been suggested that the oxygen would be absorbed by the purifying materials, even if oxygen be also specially admitted to the purifiers for the purpose of revivification. Certainly the presence of oxygen in the gas would be disastrous to the removal of sulphur compounds under some common systems of sulphur purification. The proportion of oxy-oil gas added to the coal gas at Huddersfield, would give about 0·2 per cent. of oxygen in the mixture. This amount could be detected with certainty in the gas, if present in it at the outlet of the purifiers; and an estimation of even much smaller quantities could be made according to the method devised by Dr. Otto Pfeiffer, which was recently described in the "JOURNAL" (*ante*, p. 370). It is to be hoped that precise information as to the amount of oxygen which survives the passage through the purifiers will be given by those who have the opportunity of investigating the system at work.

Since the installation of the oxy-oil gas at Huddersfield, a new system of oil-gas retorts has been designed by Mr. Herring, and introduced at those works. Mr. Holgate has given an illustration of a setting of these retorts, and the results of tests of various oils made by their aid. This system of manufacturing oil gas was described, with the help of similar illustrations in the "Register of Patents," some time ago.* It aims at subjecting the oil to progressively higher temperatures, so that, as it becomes denser through partial gasification, it flows to a hotter region in which a further part is gasified. The zones of progressively higher temperatures are obtained by the use of a double series of retorts, and by control of the circulation of the heating gases. In a typical case of the gasification of oil of about ·870 to ·880 sp. gr., the temperature in the retorts should rise from the point of admission of the oil to the point where it is completely converted into gas and coke, from about 300° Fahr. to about 1750° Fahr. The make of coke is less than with the Peebles oil-gas plant.

Some particulars as to the working of the Huddersfield oil-gas process were given by Mr. Herring in the "JOURNAL" for March 9 (p. 535). The oxygen plant was not in operation at the time of the tests; and the enrichment value of the oil gas is not stated. Nevertheless, the results are sufficiently remarkable to call for mention here, pending the publication of fuller particulars by those interested in the plant. The best average result was obtained from eleven days' work with Scotch oil of ·874 sp. gr. One ton of this oil yielded 23,750 cubic feet of gas having an illuminating power of 66·25 candles in a No. 00 burner, and 15 per cent. of its weight of coke. This yield of gas is equivalent to 317,187 foot-candles per ton of oil. Higher results were obtained in some small-scale tests with this apparatus; and the results of enrichment of coal gas by the gas produced in it would be of great interest to gas engineers.

(*To be continued.*)

PACIFIC COAST GAS ASSOCIATION.

Fifth Annual Meeting at San Francisco.

(*Concluded from p.* 584.)

The next item was the report of the Editor of the "Experience Department," Mr. John Clements, of Red Bluff (Cal.). In reference to coal, the author had gathered that Japanese coal made an excellent quality of gas—nearly 2 candles better than other kinds. But it contained a great deal of sulphur, and caused difficulties in purification. Wallsend, Greta, and other Australian coals were about equal in candle value. Wallsend gave a better and harder coke; and the same might be said of Hetton coal. South Prairie coal was found to be a good fuel. By the aid of an economizer, a duty of 10·4 lbs. of water evaporated per ton of coal had been obtained. Another correspondent had sent a very full description of his experiences with regenerator firing. A setting of his own devising remained in work for three years, using 25 per cent. of coke as fuel; the retorts taking 2½ cwt. charges, and yielding 11,000 cubic feet of gas per ton. He next tried a setting designed by Mr. A. C. Wood, of New York; and with this was able to work off 4-hour charges of 4 cwt. each. The air supply had to be accurately adjusted; a movement of only ⅛ inch on the primary damper, or ½ inch on the secondary, having a marked effect. Some information on the subject of water gas was also received. One or two members had introduced it with satisfactory results.

Attention was then directed to some suggested amendments in the rules of the Association. After one or two matters of detail had been arranged, Mr. Crockett proposed that electric works should be included in the scope of the Association, and that officers or employees of electric companies should be eligible for membership. Two-thirds of the present members, he said, were also engaged in the supply of electricity, and in this connection had friends who would be glad to join the Association. Mr. Britton supported the amendment, and was in favour of extending the qualification for membership not only to employees of gas or electric companies, but also to "one whose pursuits are connected with supplies furnished to such companies." Further, he did not believe in distinctions, and would like only one class of members. Mr. Clements suggested that the proposition was too broad. A great many people were engaged in various branches of electrical work, who had no connection whatever with lighting. Mr. Crockett agreed to accept the limitation that would be made by adding the word "lighting" after electric, wherever used. Mr. Petch was heartily in sympathy with the amendment, as he would like to see electric lighting subjects included in the agenda; and the Secretary remarked that he had difficulty in getting papers on gas subjects, while the electric light field had not been exploited at all. It was agreed that the proposition should be further considered at the next meeting.

The Question-Box was next opened; and some discussion took place on the best means of preventing moisture from accumulating on shop windows when the gas was lit. It was agreed that the cause of this trouble was insufficient ventilation, the remedy for which was obvious. Replies to an inquiry about "fibre" main-pipe, elicited statements that it could be laid as securely as ordinary cast-iron pipe, and connections made to it as readily. It was also satisfactory as regards durability, but liable to injury from the picks of workmen when the ground was disturbed for other purposes. On the subject of jointing main-pipes, old ship's ropes were favourably spoken of as useful for the "yarn" joints. In freeing service-pipes from obstructions, suction as well as pressure was preferred to pressure alone, and also before blowing out, to disconnect the pipe, so as to avoid accumulations of rust, &c., in the mains. It was stated that services laid in galvanized pipe were not found to be more durable than those in black iron; and the general opinion was in favour of tarring or varnishing the pipe. In reply to the question: "Is there any better solvent than gasoline for naphthalene stoppages?" Mr. J. D. Collins said that naphthalene was only slightly soluble in gasolene; but it was freely soluble in either coal tar or wood naphtha, and also in pure or wood alcohol. The solvent must be removed from the pipes as soon as possible after doing its work. On the topic of the best size of bricks or blocks for furnace lining, a general preference was expressed for ordinary bricks; and the use of large blocks was condemned. A request for statements of experience with steel pipes, brought out the fact that they were not so satisfactory as ordinary wrought-iron ones. They rusted in less time, and gave trouble in working—apparently because the quality was liable to variation. Mr. Guldin, by request, gave some information about gas-engines. They were now used up to 100-horse power for generating electricity, and proved quite satisfactory. In one case, where natural gas was used, the consumption per indicated horse power was 12½ cubic feet; and per brake horse power, just over 15 cubic feet. Gas-engines must not be constructed on the strains and weights used in steam-engine designs, but more on those of a steam-hammer. It was also a mistake to suppose that any kind of engineer or attendant would do for a gas-engine, as it should receive the same care and skill as a first-rate steam-engine. The gas connections should be more than large enough to supply the maximum consumption per hour, and the water supply should also be ample. Nothing but the best oils should be used for lubrication; and two or more gas-engines should never be connected up to one exhaust. He maintained that gas-engines would run as efficiently and economically as steam-engines; and he looked forward to a large increase in the demand for them. Mr. Eichbaum spoke very highly of oil-tar for ironwork of all kinds about a gas-works, and considered it superior to oxide or red lead paint.

The meeting then closed.

* See "JOURNAL," Vol. LXV., p. 25.

BIRMINGHAM CORPORATION WATER-WORKS.

As already mentioned in the "JOURNAL," a paper on the above subject was contributed by Mr. H. DAVEY at the recent meeting of the Institution of Mechanical Engineers in Birmingham. In presenting his communication, the principal portions of which we reproduce below, the author acknowledged his indebtedness to Mr. E. Antony Lees, the Secretary of the Corporation Water Department, who had collected for him the notes on the history of the undertaking.

For supplying with water the town and neighbourhood of Birmingham, a Company was incorporated in 1826, and in the same year obtained their first Act of Parliament, fixing their capital at £120,000, with power to borrow £30,000 more. The source of supply was the River Tame only; and a storage reservoir capable of containing 30 million gallons was constructed at Aston, into which the water from the river was turned on Aug. 17, 1831. The further initial works were two pumping-engines at Aston, still in use; and a storage reservoir in Monument Lane, Edgbaston, having a capacity of 4¼ million gallons.

In 1838, the town of Birmingham was incorporated; and the new Corporation appeared to have entertained almost from the commencement the idea of acquiring the water undertaking. The Birmingham Improvement Act passed in 1851 included a clause which empowered the Corporation to supply water to the borough, and to purchase the existing works at a price to be fixed by arbitration or by a jury. In 1853, their capital being exhausted, the Company determined to apply for additional powers; and in March, 1854, the Corporation gave notice, under their Act of 1851, to purchase the undertaking. The Company obtained their Act on June 2, 1854, whereby their authorized capital was raised to £240,000, and their borrowing powers to £60,000. The Act recited the notice from the Corporation of their intention to purchase; and enacted that for three years thereafter new works proposed to be executed by the Company should be subject to the Borough Surveyor's approval. The contingency of the Corporation purchasing the undertaking within two years from the date of their notice given in 1854 was also provided for.

In consequence of the poisoning of the Tame in September, 1854, the supply of water to the town was entirely cut off for some days. The need for a further source of supply being thus brought home to the Company, they obtained another Act in 1855, increasing their capital to £420,000, and their borrowing powers to £105,000. The works were immediately enlarged by the construction of additional reservoirs at Witton, impounding the water of the Perry Stream and of the Hawthorn Brook or Witton Stream; and from time to time the works were further added to. After an unsuccessful application in 1865, another Act was obtained in 1866, whereby the area of supply was considerably extended, and the capital increased to £756,000, and the borrowing powers to £189,000.

Preliminary borings had already been made at Aston, with a view to the construction of a deep well. These mark a new start in the water supply of the town; and from this date the Company turned their attention to obtaining supplies from deep wells. After the first well at Aston, these were sunk successively at King's Vale, Perry, and Witton (now called Short Heath). By their last Act, obtained on July 14, 1870, the capital was not altered, but the area of supply was extended, and power was given for the construction of new works. These included a well at Selly Oak, a storage reservoir at Erdington, and the present extensive works at Whitacre and Shustoke for impounding the water of the Blythe and Bourne. It was provided that the water from the rivers should be carefully filtered; and power was given to the Corporation to appoint an inspector for testing the quality of the supply. In 1872, a small reservoir at Whitacre was completed; and the water of the Blythe was brought into use; part of the land was acquired for the large reservoir at Whitacre, and also for the proposed well at Selly Oak; and in 1874, the land for the storage reservoir at Erdington was purchased. This practically completes the history of the undertaking as the property of the Company, whose capital at the close of 1875 stood as follows:—

	Capital.	Borrowing Powers.
Authorized by Act of 1826 ..	£120,000 ..	£30,000
" " 1854 ..	120,000 ..	30,000
" " 1855 ..	180,000 ..	45,000
" " 1866 ..	336,000 ..	84,000
Total at the end of 1875.. ..	£756,000 ..	£189,000
Amounts actually raised ..	£672,000 ..	£189,000

In 1874, application was made to Parliament by the Corporation for the transfer of the undertaking by agreement, or for its compulsory purchase; the advisability of its acquisition being urged as a matter of public policy rather than of finance. An Act empowering the purchase was obtained on Aug. 2, 1875; and the transfer was effected on Jan. 1, 1876, in consideration of £54,491 in perpetual annuities, made up as follows: £33,600, the maximum dividend of 8 per cent. on the £420,000 of capital authorized under the Act of 1855; £17,640, the maximum dividend of 7 per cent. on the £252,000 of capital subsequently called up; £2376 in respect of possible profit on the remaining £84,000 of capital not called up; and £875 as compensation for back dividends unpaid. The debt of £189,000 incurred under the borrowing powers was taken over by the Corporation. Assuming the annuities to be capitalized at 25 years' purchase, the £54,491 a year was equal to £1,362,275, and comprised a premium or goodwill of £690,275—that is, the difference between the £672,000 capital of the Company and the capitalized value (£1,362,275) of the annuities. The capital at the time of the transfer was thus £1,362,275, *plus* the debt of £189,000; making a total of £1,551,275.

The management of the undertaking then devolved upon the Corporation, who carried out certain works initiated by the Company, and at once took steps for compelling the owners of properties which were without satisfactory water supplies to lay on services from the water-mains. The revenue during 1875—the last year before the transfer—was £87,350; and under the Corporation it advanced to £127,504 by 1882, notwithstanding that in 1881 reductions of water-rents had been made to the extent of £5000 per annum. The Act of 1875 empowered the raising of £250,000 additional capital, of which £100,000 was subject to the approval of the Local Government Board. The extensions of mains and the construction of other works quickly exhausted these powers; and as the increasing demand for water required still further works, it was deemed expedient to renew the lapsed powers previously obtained for the construction of the works at Shustoke for impounding the water of the River Bourne. Accordingly, in 1879, an Act was obtained renewing these powers, and authorizing the borrowing of £300,000 additional; bringing up the authorized capital to £2,101,275.

The area of the Birmingham water supply at the present time comprises a population of 725,000, of which it is estimated that about 688,500 are actually supplied. The number of houses served on March 31, 1897, was 137,703, in addition to 11,522 miscellaneous unmeasured supplies for other than domestic purposes. There were also at that date 2850 supplies by meter for trade uses. From 8,200,000 gallons in 1876, the daily demand for water continued to increase, so that in the year ended March 31, 1891, it had risen to more than double that amount, or 16,500,000 gallons. The increasing demand led to the apprehension that in the near future the sources of supply would become insufficient; and after full inquiry, an Act was obtained on June 27, 1892, whereby the Corporation were empowered to obtain a supply of water from the Rivers Elan and Claerwen in Radnorshire. The capital authorized is £6,600,000. The Welsh supply scheme was prepared and carried through Parliament by Mr. James Mansergh, who is now engaged upon the first portion of the work, by means of which 27 million gallons per day may be brought into Birmingham by gravitation at an elevation of 603 feet above Ordnance datum. The ultimate quantity available will be 67½ million gallons per day; and the total length of the aqueduct is about 73 miles. It will be several years before the works can be completed, and the Radnorshire water be distributed in Birmingham; but when finished they will stand in the foremost rank among the great works of water supply for large communities.*

In the meantime, it is necessary to meet the growing demand for water, and to maintain the present works in an efficient state. In view of the large expenditure on the new supply, it is also important that the capital expenditure on the old works should not be more than is absolutely necessary. At the present time, the water supply for Birmingham is derived partly from streams and partly from wells. The streams are the Rivers Bourne and Blythe at Whitacre, Plants Brook, and the Perry Stream. The average bulk of water taken from them annually is equal to about 10½ million gallons per day, and the average quantity drawn from the wells is about 6 million gallons per day; the average daily consumption for the last year being about 16½ million gallons, with a maximum of 21 millions. The whole of the water taken from the streams, and some of that drawn from the wells, is passed through filter-beds, where it is efficiently filtered before being mixed with the rest of the well water, and pumped into the service reservoirs for distribution. The domestic and trade consumption of water has greatly increased with the growth of the population; but the quantity distributed has been kept down by reducing waste and economizing in various ways. The past year has been an exceptionally favourable one with its mild winter. A severe winter increases the average consumption of water by waste from bursting of mains, running taps, &c.

The service reservoirs are so situated as to divide the water area into three zones of distribution: First, the low-level zone, supplied under pressure from the Erdington reservoir, in which the top water is 470 feet above Ordnance datum; second, the mid-level zone, supplied under pressure from the Monument Lane reservoir, Edgbaston, in which the top water is 532 feet; and, third, the high-level zone, supplied under pressure from the Hagley Road reservoirs, Edgbaston, in which the top water is 601 feet above Ordnance datum. A portion of the high-level zone being at about this same elevation, and therefore too high to be supplied through the reservoir, is supplied by a stand-pipe, the top of which is 650 feet above Ordnance datum.

Beginning with the Whitacre pumping-station at the lower end, the Shustoke reservoir at half a mile distance has a capacity of 442 million gallons, and receives its supply from the River Bourne. A smaller reservoir, holding 32 million gallons, is supplied from the River Blythe. The Shustoke reservoir is at a sufficient elevation to deliver its water direct to the filter-beds; but steam-pumps are employed to pump water up to them from the Blythe reservoir, which is at a lower level. The filter-beds have a collective area of 183,504 square feet, and are large enough to allow of as much as 10 million gallons per day being pumped from this station. There are two compound pumping-engines, each having cylinders 33 inches and 60 inches in diameter and 10 feet stroke, and each working a pair of 26-inch plunger pumps of the same stroke; also two Cornish engines, each having a cylinder 72 inches in diameter and 11 feet stroke, and a 24-inch plunger pump of 10-feet stroke, with a filter-pump 30 inches diameter and 7 feet stroke. The engines are supplied with steam from a range of water-tube boilers, some of which are worked at 70 lbs. pressure for the compound engines, and the rest at 30 lbs. pressure for the Cornish engines. The pumping main from Whitacre is 36 inches diameter, and extends *viâ* Plants Brook to the Erdington reservoir, a distance of about eight miles.

The steam-pumps for lifting the water to the filter-beds from the Blythe reservoir were originally worked non-condensing, with

* A description of these works has already appeared in the "JOURNAL."

low-pressure steam from the boilers supplying the Cornish engines. They are of duplex type, carrying full steam throughout the stroke without expansion. They originally exhausted into the atmosphere, and consumed a large quantity of steam—almost as much as would work one of the large Cornish engines. Finding that the cylinder capacity of the pumps was sufficient for enabling them to be worked with the difference in pressure between the high and the low pressure boilers, the author made the following alteration for reducing their consumption of steam: From the high-pressure steam-main a new supply-pipe was led direct to the steam-pumps, while the exhaust was conveyed by another pipe into the low-pressure steam-main of the Cornish engines. The economy of fuel resulting from this alteration has been great; while, in addition, a distinct advantage has been secured from the pumps now working against a back-pressure, instead of exhausting freely into the atmosphere. They work much more quietly, and a greater speed is obtained with less wear and tear.

At Plants Brook there is a storage reservoir of 33 million gallons capacity, with filter-beds of 99,991 square feet area, and two pumping-engines—one a Cornish engine, having a cylinder 60 inches in diameter and 9 feet stroke, with a 26-inch plunger pump; the other a compound engine, having cylinders 28 and 48 inches in diameter respectively, and 8 feet stroke, working two plunger pumps 26 inches in diameter and 4 ft. 8 in. stroke. Both engines are supplied with steam from the same range of water-tube boilers, at a working pressure of 45 lbs. per square inch. This station is used for testing the quality of the engine slack supplied to the various pumping-stations. The water pumped here is delivered 3½ miles to the Erdington reservoir, from which, together with that pumped at Whitacre, it is conveyed to Aston—supplying the low-level zone by direct pressure from Erdington. The quantity being much greater than that required in the low-level zone, the surplus is pumped at Aston nto the mid-level zone under pressure from the Monument Lane reservoir. This surplus is pumped by two compound pumping-engines, each having cylinders 16 and 32 inches in diameter respectively and 5 feet stroke, and each working a pair of plunger pumps 20 inches in diameter and 5 feet stroke. The suction of the pumps draws from the Erdington main, while the delivery is into one of the mains leading to Monument Lane. In this way the pressure on the suction side of the pumps is utilized; and the work done by the engines is only the difference in pressure between the mid-level and low-level zones.

The station at Aston is the largest,and most important of the pumping-stations, and the bulk of the water derived from various sources is brought here to be pumped up into the Monument Lane reservoir, Edgbaston, whence part of it is again pumped to supply the high-level zone.

On the Aston side of Edgbaston there are five wells, yielding daily the following quantities of water: Aston No. 1 well, 660,400 gallons; No. 2 well, 1,288,100 gallons; Perry well, 1,100,000 gallons; King's Vale well, 363,000 gallons; and Short Heath well, 1,600,000 gallons. On the other side of Edgbaston there are two other wells—one at Longbridge, yielding last year 425,000 gallons per day; and the other at Selly Oak, yielding last year 513,000 gallons daily. The water from the wells on the Aston side is pumped for distribution by the engines at Aston; while the Longbridge and Selly Oak wells are provided with engines which partly supply the high-level zone in connection with the Hagley Road stand-pipe.

The Aston pumping-station was established by the Water Company incorporated in 1826. There were erected as far back as 1828 and 1830 two pumping-engines which are still existing—named Atlas and Hercules. These have been kept at work ever since, excepting the necessary stoppages for repairs from time to time. They are now in first-class order, and are likely to last as long as they will be required. Their cylinders are constructed on the Cornish plan, and are 60¼ inches in diameter and 8 feet stroke; but as the pumps are of the bucket kind, the engines cannot profitably be worked expansively. The other engines at the Aston station are the following: Two Cornish engines erected in 1852 and 1853, each having a cylinder 72 inches in diameter and 10 feet stroke, with a 23-inch plunger pump of the same stroke; a pair of coupled fly-wheel engines erected in 1867, having cylinders 48 inches in diameter and 8 feet stroke, with two bucket-and-plunger pumps, each 19½ and 27¾ inches in diameter in the barrel; and the two compound engines which were erected in 1881. All these eight engines, or as many of them as may be required from time to time, are employed to pump to the mid-level zone, and into the Monument Lane reservoir. The six single-cylinder engines are all working with low-pressure steam of about 20 lbs. per square inch, supplied from three sets of Cornish and Lancashire boilers; while the compound engines are supplied with steam at 70 lbs. pressure per square inch from a separate range of water-tube boilers. With a view to effect economy in fuel consumption without the necessity of large capital expenditure, and at the same time to provide additional pumping power to meet the maximum demand on the station, the author lately had recourse to the principle involved in the alteration already described of the duplex steam-pumps at the Whitacre station.

The engine power at the Edgbaston station, and also that at Longbridge and Selly Oak, is employed for the purpose of supplying the high-level zone under pressure from the Hagley Road reservoir and stand-pipe. The consumption of water for domestic supply varies so largely at different hours of the day, that in pumping under the stand-pipe pressure, without any overflow, the speed of the engines would also have to be largely varied during the day time, in order to meet the fluctuating demand of the stand-pipe district. The Edgbaston engines are therefore made to supply the reservoir for the high-level zone by overflow through the stand-pipe; and the stand-pipe itself has to supply only the higher portion of the zone. By restricting this higher portion within proper limits, the full pressure is always maintained in the pipe, though the engines are only just capable of pumping the mean supply of both districts. In other words, the maximum draught in the higher or stand-pipe district does not exceed the combined mean draught of this higher portion and of the rest of the high-level zone.

As already mentioned, the total supply of 16½ million gallons of water per day is made up of about 10½ millions from streams and 6 millions from wells. During a dry period of (say) 180 days, the watersheds supplying the streams may be calculated to yield from 7 to 8 million gallons per day. This with the total storage of about 500 million gallons would give a daily supply of a little more than 16½ million gallons. The total average yield of the wells cannot be increased, and tends to diminish; and, from experience gained, it is evident that but little more water could be expected from underground sources. It will be seen that some of the wells yield but small quantities. During the summer of 1896, the storage was so heavily drawn upon that it was the cause of much anxiety. It has been necessary to adopt the strictest economy of water by the prevention of waste and by other means. In 1894, the average gross consumption per head per day was 25·92 gallons; in 1896-7, it had been reduced to 23·70 gallons. In the same period, the net consumption per head for domestic supply, fire, and waste was reduced from 19·62 gallons to 15·11 gallons. In the year to March 31, 1897, the average consumption per head per day was as follows: Gross consumption, 23·70 gallons; for measured trade supplies, and for railways, road watering, markets, &c., 4·39 gallons; estimated consumption for unmeasured trade supplies, 4·20 gallons; net estimated consumption for domestic use, fire, and waste, 15·11 gallons. The total revenue of the Water Department for the financial year to March 31, 1897, was £202,059.

The cost of pumping varies greatly with the different stations. The stations with small supplies are exceedingly expensive; but the large stations are working with fair economy. At Whitacre the total cost of pumping 1000 gallons of water 100 feet high, including coal, salaries, wages, and stores, averages something under ¼d.

Being owners of both the gas and the water works, the Corporation of Birmingham established some years ago a hydraulic power supply, which was placed under the management of the Water Department. The hydraulic power is produced by means of gas-engines and pumps. The engines take gas from the ordinary mains, and the pumps take water from the mains in the mid-level zone, and are therefore under pressure from the Monument Lane reservoir. There are three Otto-cycle gas-engines—two of 20-horse power each, and one of 12-horse power. Each engine drives, by means of belts and gearing, a set of three-throw pumps. The pressure in the delivery mains is 750 lbs. per square inch. The supply is governed by means of two accumulators, each loaded to about 90 tons, and one slightly heavier than the other. Each accumulator has a ram 18 inches in diameter and 20 feet stroke. The starting of each of the engines is effected by means of a three-cylinder hydraulic engine, taking its power from the hydraulic main. By means of a hand-lever, a small pulley on the shaft of the hydraulic engine is pressed against the rim of the gas-engine fly-wheel, and by frictional contact the engine is turned. The average revenue per 1000 gallons supplied during the year ending March 31, 1897, was 65·4d. Already 3¾ miles of hydraulic mains have been laid; and the station is arranged for a large extension of machinery whenever found necessary.

The Dauber Gas Generator.—Our report of the recent paper by Mr. Corbet Woodall, on "Carburetted Water Gas," before the Institution of Civil Engineers (see "JOURNAL" Vol. LXIX., p. 1241) has attracted the attention of Herr A. Dauber, of Bochum. He has addressed a communication to the Institution respecting a modification of his reducing furnace, which is thereby adapted for the production of gas. Briefly, it is a vertical generator, to which a regulated stream of air is admitted through the spaces between superimposed cones at its base. The generator is filled, and kept full, with material—which may be coal, coke, or any combustible residue—and the combustion of the lower layers heats and carbonizes the material in the upper layers, while the carbonic acid produced by the combustion is reduced in the upper part of the generator and also yields combustible gas. Through the vertical axis of the cones, steam produced by means of a coil in the exit of the generator is also introduced; and this forms water gas, which also mixes with the products of carbonization. If the gas is required for lighting purposes, a spray of oil may be introduced through the same axial pipe; and the gas is thereby carburetted to any degree. The gas is said to cost less than 3½d. per 1000 cubic feet. The apparatus was described, with illustrations, in the "Technische Revue" for Sept. 27, 1896.

REGISTER OF PATENTS.

Prepayment Fluid Meters.—Green, H., of Preston. No. 19,067; Aug. 28, 1896.

In a prepayment meter according to this invention, there is a compound cock, comprising two hollow plugs—one adapted to be actuated by mechanism worked by the fluid pressure (hereafter assumed to be gas), and the other to be actuated by hand, through appropriate mechanism, when a coin has been inserted into the proper part of the apparatus. The two hollow plugs are so arranged that, in certain relative positions, they close the gas-passage; and then if a coin be inserted through the slot of the meter, and a handle provided for the purpose be actuated, the one hollow plug may be actuated to a given extent, whereupon the gas-passage through the compound cock will be opened, and as gas flows the hollow plug that is in gear with the measuring mechanism will be actuated by the gas pressure so as, by the time the quantity of gas paid for has been delivered, to again close the gas-passage through the compound cock. Means are provided to prevent the hand-operated plug from making a complete rotation in relation to the gas-operated plug, and so overrunning the latter and consequently preventing the delivery of the full quantity of gas paid for.

Figs. 1, 2, 3, and 4 are respectively a plan, a side elevation, a rear elevation, and a section of the compound gas-cock and coin-freeing and operating mechanism of a wet meter of the ordinary kind; but the apparatus may be combined with measuring mechanism of any other construction of meter, so long as one plug of the compound cock can be actuated by the fluid, and the other be moved by hand, as set forth.

Fig. 1.

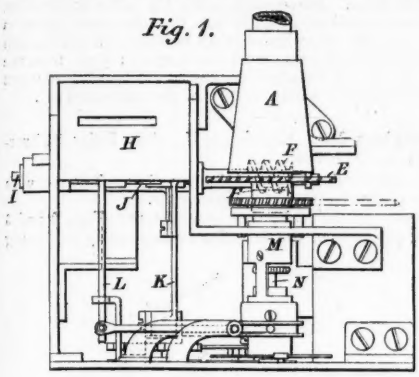


Fig. 2.

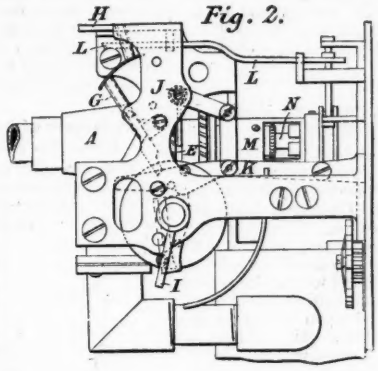


Fig. 3.

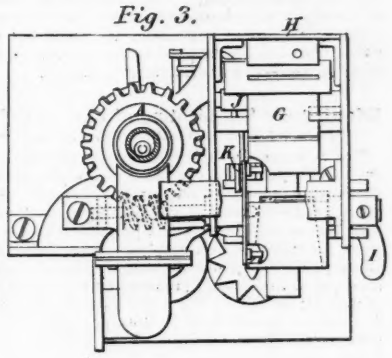
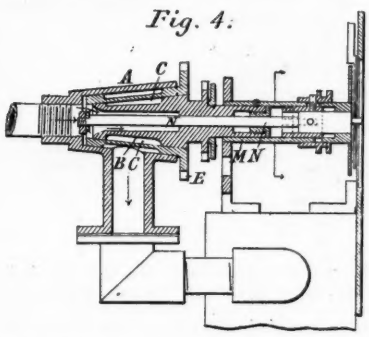


Fig. 4.



The compound cock (shown more particularly in fig. 4) is constructed as follows: The barrel A is conical, with the gas-inlet at the small end and delivery at the side. Within this is a plug formed as a hollow truncated cone, fitting the interior of the barrel rear its end portions, but made of reduced external diameter between these portions, so as to form an annular gas chamber all round between the exterior of the outer plug and the interior of the barrel. Through the wall of the outer hollow plug, there is an opening through which, when it is not closed by the inner hollow plug B, gas will flow. This inner hollow plug is of an external form adapted to fit within the outer one at its end portions, and also for a portion of the circumference connecting the end parts. The remainder of the plug is of reduced external diameter, so as to form between it and the interior of the outer plug a chamber C, extending almost entirely round the inner plug. Through the walls of the reduced part of the inner plug, there are openings through which the gas can flow into the chamber between the inner and outer plugs. The outer plug is actuated by hand through a worm D and worm-wheel E; the latter being fixed on the plug. The inner plug is actuated from the meter proper through a worm F gearing with a worm-wheel fixed on the spindle of the plug. There is a pin which prevents the outer plug making a complete rotation relatively to the plug B by coming in contact with the closing part.

The coin freeing and operating mechanism is as follows: There is a coin-shoot G pivoted beneath a slotted plate H; and below it there is mounted on a short shaft a coin-holder, which, in one position of the parts, has its open end upward and opposite to, but below, the lower end of the shoot, so that a coin dropped in will enter the coin-holder. On the shaft there is an external arm or handle I, by which it can be moved in a rotary direction. Assuming a coin to be in the holder, if its shaft be then turned, the coin will be caused, by acting on an arm projecting from a rock-shaft J, to actuate a locking-device so as to release the shaft of the worm D that is in gear with the outer plug.

This locking-device comprises a lever which is linked to an arm projecting from the rock-shaft J, and is formed with a notch adapted to become engaged with one or other of a pair of rearwardly projecting studs on a disc fixed to the worm-shaft on D. As the coin-holder is further moved after the release of the shaft, a part of the coin will come in contact with one of a pair of forwardly-projecting studs shown on the disc, so as to turn the worm-shaft during the remainder of the forward movement of the coin-holder. The coin is prevented from falling out of the holder until the completion of the stroke by a guard plate; and so during such further movement, the outer plug will be turned through the worm D and worm-wheel E. On the termination of the stroke, the coin-holder will be upside down; and the coin will fall into a coin-receptacle. By this operation, the opening through the wall of the outer plug will have been moved from opposite the closing part of the inner plug, so that gas will flow in the direction of the arrows—assuming delivery to be taking place; and, as the gas flows and so works the meter, the latter will, through the worm F and its worm-wheel, actuate the inner plug so as, by the time the quantity of gas paid for has been delivered, to bring its closing part again opposite to the opening of the outer plug, and thus again close the gas-passage.

After the coin in the coin-holder shall have operated, the lever K will have resumed a position in which it will be in readiness to become engaged, during the rotation of the worm-shaft on D and the disc, with the other stud, so as to lock the shaft, at the end of its partial rotation, until, by the insertion of another coin and partial rotation of the coin-holder, the driving-shaft of the outer plug is again released in the manner indicated. The movement of the handle I is limited by stop-pins.

To prevent coins being inserted when the parts are not in position to enable a coin to fulfil its office, the upper part of each coin-shoot arranged below the slotted plate H (which may be the cover of the apparatus) is provided with a plate or closing device, so mounted as to assume a position in which the coin-slot will be closed, or partly closed, whenever a partial forward movement of the coin-holder having been effected, it has not completed the movement necessary to permit delivery of the gas already paid for, and been returned into the proper position for receiving a fresh coin. If it be attempted to return the holder before the coin drops out, the arm will prevent the coin-holder being brought into contact with the shoot G. But during the return movement of the coin-holder, after the ejection of the coin, the opening of the coin-slot is effected. This, however, may be done in various ways. The shoot may be fixed, and a separate closing-device be provided in connection with the coin-holder shaft, or some moving part of the apparatus, so that the slot-closing plate will be operated independently of the shoot for opening and closing the coin slot.

The apparatus is so arranged that only a limited number of coins can be inserted into it, one after the other, before any consumption of gas can occur. When the maximum number of coins have been inserted, and the handle I operated a corresponding number of times, further rotation of the outer plug relatively to the plug B is prevented by the pin. If another coin were then allowed to be inserted, an attempt to further rotate the outer plug might result in the machine being strained or the pin being sheared off. In order to prevent this, the coin-slot through the plate H may be blocked shortly before the pin comes into contact with the other parts, by means of a sliding bar L, to which motion is given at the required time in the following manner: To the outer end of the inner plug B is fixed a tubular extension M formed with a slot, which for a part of its length is at right angles to the axis of the extension, but towards its outer end is inclined. To a cross-bar at the inner end of the plug is fixed a spindle N, which extends centrally through the hollow outer end of the inner plug B into the extension, and is there fitted with a sleeve attached to it by a pin-and-slot connection, so that the sleeve can move lengthwise upon, but cannot turn about, the spindle. Upon the extension M is mounted a grooved collar, fixed to the sleeve by a pin that passes through the slot. When the gas-passage through the compound cock is closed, the pin will pass through the straight portion of the slot. But as the outer plug is rotated relatively to the inner plug, the sleeve will be correspondingly rotated relatively to the slotted extension M; and the pin will thus be caused to travel towards the inclined part of the slot. If, however, sufficient coins be inserted, without consumption of gas taking place, to enable the outer plug to be turned almost a complete rotation relatively to the inner plug, the pin will travel along the inclined part of the slot, and the sleeve and collar moved lengthwise of the extension. This longitudinal movement of the collar is communicated by a lever to the bar L, so that it is caused to assume the position indicated by dotted lines in fig. 2; and thus prevent the insertion of another coin until the consumption of gas causes the rotation of the inner plug relatively to the outer one, when the collar will be moved back to its normal position, and the bar L withdrawn.

As a modification of the arrangement, the compound cock referred to may be combined with two hollow plugs; the mechanism in connection with one of the plugs being adapted to be worked by pressure of fluid flowing through the apparatus, and with coin-controlled mechanism so constructed and arranged in connection with the other plug that the combined apparatus is adapted for delivering different quantities

of fluid in exchange for different coins. For example, a pennyworth of gas could be obtained in exchange for 1d. inserted into one slot, or a shillingsworth of gas in exchange for 1s. inserted into another slot.

Burners for Incandescent Mantles.—Bellamy, C. R., of Liverpool. No. 23,250; Oct. 20, 1896.

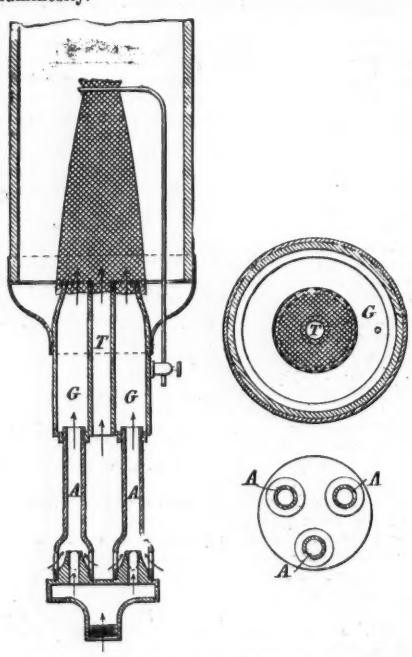
The patentee claims to use, in combination with an incandescent gas-burner, a shield of wire gauze or the like, interposed between the bottom of the chimney and the air-inlet holes of the mixing chamber, so as to prevent the conduction of flame to the latter from the chimney, and to diffuse the air supply. The patentee states that he has found that such a shield not only effectually prevents the lighting-back of the burner, but also serves to keep the flame steady in places where it is subjected to sudden inrushes of air—as, for example, in shops, vestibules, and the like, where the opening of an outside door is accompanied by an inrush of air which, with burners as at present constructed, finds its way up one side of the chimney and affects the light, but which, when the shield is fitted, is so diffused by passing through the small mesh of the wire gauze as to be ineffective in disturbing the flame.

Effecting the Self-Lighting of Gas.—Grundy, F. B., and Moeller, J., of Palmer Street, Westminster. No. 23,483; Oct. 22, 1896.

The patentees in their specification (which is not illustrated) point out that it has often been suggested to use platinum black along with various substances—such as clay or meerschaum—in making appliances for effecting the lighting of gas playing upon them. Their proposal in this direction is to intimately mix pulverized kaolin with a gritty substance—such, for instance, as amorphous silica, obtained by drying the gelatinous silica produced on decomposing sodium silicate by hydrochloric acid, or amorphous titanic acid prepared by fusing titanic acid with acid sulphate of potash; dissolving the cooled melt in water; and boiling the solution. Amorphous titanic acid is thus precipitated; and equal weights of the silica or titanic acid to kaolin form a good proportion. The mixture is made into a thick paste, of which balls, rods, or other suitably-shaped bodies are formed. These are dried and baked at a moderate red heat—not so high as to give them a ceramic character—and, after they are cooled, they are immersed in a strong solution of platinum salt, such, for instance, as the chloride. After this, they are dried at a moderate heat, and treated so as to convert the platinum salt into platinum black, which permeates the pores of the appliances. The reduction of the chloride may be effected by heating the appliances to about 170° C., and subjecting them to the action of coal gas. Or this may be effected by immersing the appliances for some time, or repeatedly, in heated oil or melted paraffin wax, and burning off the combustible matter.

Incandescent Gas-Burners.—Denayrouze, L., of Neuilly, France. No. 1777; Jan. 22, 1897.

This invention has for its object "to obtain increased intensity of heating power directed on an incandescence mantle, and consequent increased luminosity."



For this purpose, the burner is constructed as shown of three or more bunsen tubes A, arranged circularly on a chamber supplied with gas, and receiving air by lateral orifices near their bases in the usual way. They open at the top into an annular chamber G, formed around a central air-tube T; this chamber being about the height of the blue cone usually seen in a bunsen flame, and having its mouth covered with wire gauze. No air being admitted to the glass chimney, the burners A and G, as well as the central air-tube T, are subject to the draught; and while the flame issues from the meshes of the wire gauze, the air current issuing by the central tube, and expanding laterally, directs the flame against the sides of the suspended mantle M, which extend down a little under the mouth of the burner, and which are thus intensely heated.

The claim made for the invention is for "a burner for incandescent gas-light consisting of several bunsen burner-tubes leading into an annular chamber covered by a wire gauze, and surrounding a central air-tube, constructed and operating substantially as described."

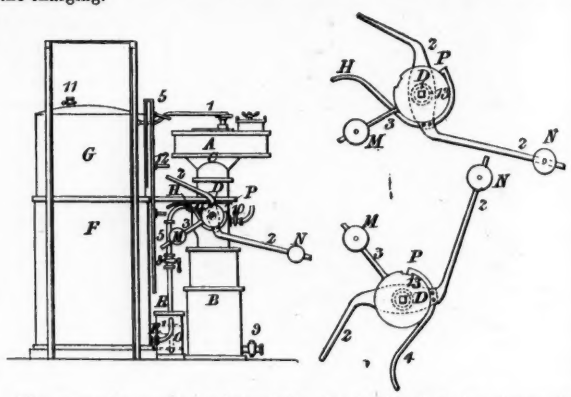
Lamp for Street Lighting and Destroying Sewer Gases.—Gibson, J. G., of Poplar, E. No. 6221; March 9, 1897.

For the purpose of his invention, the patentee proposes to place a cover over the lantern with three distinct chambers—the bottom being a "hot-air furnace" heated from the light in the lantern. The base of the furnace is composed of a metal-plate; and fitted to it are a number of small metal tubes equal in size to the area of the hole in the lamp column. Another metal plate placed near the top of the tubes constitutes the furnace. The top plate has a small marginal opening to pass the hot air generated there into the second or combustion chamber. The heat from the gas passes through these tubes; and, in addition, the heat from the bottom plate gives a heat in the "furnace" of from 400° to 500°. The furnace and combustion chamber are covered with a metal dome, which intensifies the heat. On the top of the dome is fixed a third or exhaust chamber, of a tubular form. An opening at the top of the combustion chamber passes the heated and purified air into this chamber, where it goes out at the sides through a number of small holes for exhausting the air. An ordinary lamp-column serves to fix the lamp on; pipes from the sewers being laid to the base of column. As the upper chambers exhaust themselves, the foul air ascends rapidly to replace the exhausted air.

Manufacture of Acetylene Gas.—Kesselring, U., of St. Imier, Switzerland. No. 9714; April 15, 1897.

This apparatus has for its object the manufacture of acetylene gas with automatic regulation of the charging of the generator.

Fig. 1 is a general view of the apparatus in elevation. Figs. 2 and 3 show the two extreme positions of the valve for automatically regulating the charging.



The apparatus consists substantially of a holder F G for storing the gas, and of a generator comprising a distributing drum A, divided internally into eight to twelve sectors. The sectors have moveable bottoms; and being filled with carbide of calcium, they are brought successively above a funnel C, which leads the charges of carbide into the water-box B, where the re-action is produced each time the bell G of the gasholder rises, and the lever I fixed to the bell pushes a fresh sector over the funnel. Each charge falls through the funnel on to a trap or valve, which opens at the proper time to allow the charge to fall into the water box by means of an arrangement of levers 2, 3, 4, and closes as soon as the charge has fallen.

The operation of this automatically and instantaneously closing trap constitutes the subject of the invention: The charging-valve is operated by a shaft D, on which is keyed a plate 13 (fig. 1). To this plate there is fixed a lever 3, carrying a counterweight M. Another lever 2 (bent as shown) is capable of freely rotating on the shaft D, and has also a counterweight N situated at some distance from the shaft. Finally, a third doubly-bent lever 4 is fixed to the lever 2, and slides on the periphery of the plate 13, which is formed with a notch Q at a certain point of its circumference. The lever 4 is terminated by a spur or projection P, which engages at the proper time in the notch Q.

In the position shown in fig. 1, the trap is closed; the consumption of gas causing the bell G to descend. A lever 12, attached to a rod 5, which is itself fixed to the bell G, and is guided by devices (not shown for the sake of clearness), presses upon the left-hand portion of the lever 2. This portion descends, while the counterweight N rises. The lever 4 ascends, and its projection or spur P falls by its weight into the notch Q. The three levers form at this moment as it were one piece. The lever 12, when it has arrived near the lower end of its downstroke, becomes disengaged from the lever 2. The balance-weight N, which is then at its highest point, acts by means of the levers 2 and 4 upon the plate; and the balance-weight M rises. This opens the inner trap, and allows the carbide of calcium resting upon the latter to fall into the water-box B. At this moment, the bell of the holder is at the bottom, and does not hold any gas. The re-action now takes place in the generator; the gas being evolved immediately, and the bell rising rapidly. The lever 4, being pushed upwards by the lever 15 fixed to the rod 5, becomes disengaged from the notch Q; and the lever 3 descending under the action of its counterweight M, the internal valve closes instantaneously.

Fig. 2 illustrates the arrangement of automatic closure in the closed position of the valve; while fig. 3 shows the apparatus in the opened position. The rod 5 fixed to the bell of the holder effects the whole of the operation. The generated gas passes through a pipe R into a purifier O, which is filled with moss, and has a diaphragm of sheet metal which retains the solid particles of lime carried over by the gas. The drawbacks of carrying over are thus obviated; the chief drawback consisting in the stoppage of the burners. The pipe R extends to near the bottom of the purifier, and is provided with a cock 8, which should be closed when the apparatus is being charged. The gas passes to the holder from the purifier by a pipe R^1. A discharge-cock 9 permits of the water being discharged from the box. When it is desired to expel at the same time the lime which remains at the bottom of B, the cocks 8 and 10 are closed; the pressure existing in the generator then driving out with violence the water which carries away the lime. When it is desired

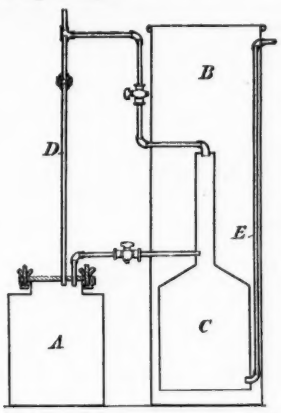
to empty the apparatus without pressure, the cock 10 is opened; and then when the gas has escaped, the discharge is effected by means of the cock 9. A safety-cock 11 serves to effect a rapid discharge of the bell of the holder.

Gas and Oil Motors.—Bracklow, C., of Elmhorn, Germany. No. 16,399; July 10, 1897.

This invention relates to an improvement in motors for gas or liquid fuels (more particularly the latter); and it consists of a new construction of the working-piston, applicable for use simultaneously as a pump-piston for cooling air and for giving a better guiding than in the hitherto known constructions; and, further, of a new arrangement of the explosion cylinder, by which a better and more equal mixing of the gas with the air is obtained, in order to avoid missing explosions.

Acetylene Gas Generators.—Godin, E., of Quebec, Canada. No. 17,021; July 19, 1897.

In the arrangement of apparatus shown, A is the vessel to contain the carbide of calcium; B, a vessel for holding water; and C, a vessel open at the bottom and supported in the lower part of B. The vessel A has a removable cover, with a gas-pipe D attached to it. A pipe is connected to D, and to the upper part of the vessel C. Another pipe is joined to the cover of A, and to the vessel C. E is an escape-pipe connected to the lower part of the vessel C, and passing out of the vessel B a little below its top. A branch-pipe is connected to the pipe D for conducting the gas away as made.



The vessels B and C are filled with water to a little above the outlet-pipe, and more water is added from time to time so as to keep the water standing as nearly as possible at a uniform level. Water is admitted to the carbide by opening the valves on the various pipes. When too much gas is formed in the vessel A, it passes down the outlet-pipe and depresses the water in the vessel C below the level of the pipe, so that the supply is cut off automatically. When a large supply of gas is formed in the vessel A, so that the water in the vessel C is forced down below the level of the escape-pipe E, the surplus gas escapes up the pipe, which also serves for the escape of water should the vessel B be filled too full.

Incandescent Gas-Lamp Fittings.—Winkler, H., of Berlin. No. 22,348; Oct. 8, 1896.

This invention relates to a fitting for suspending incandescent gas-lamps and the like, comprising a horizontal gas-pipe secured at one end by a ball-and-socket joint to the gas-supply pipe, and at the other end to the lamp to be suspended and to the ceiling or other support by means of a spiral spring. As an alternative, the fitting may comprise a coiled elastic gas-pipe fitted to the supply-pipe at one end, and at the other end to the lamp to be suspended to the ceiling or other support.

APPLICATIONS FOR LETTERS PATENT.

20,974.—Richmond, E. W. T., "Gas-burners." Sept. 13.
21,001.—Trewin, A., "Guard or protector for use with mantles for incandescent gas lighting." Sept. 13.
21,003.—Barnett, A. E., "Repairing gas, water, and other pipes and mains." Sept. 13.
21,094.—Ellis, G. B., "Producing acetylene gas." A communication from N. Lepage and L. M. Maisonnier. Sept. 14.
21,114.—Bean, H. R., and Ringwood, H., "Generation of acetylene and other gases." Sept. 14.
21,127.—Thwaite, B. H., "Production of combustible gas." Sept. 15.
21,150.—Carter, J., "Incandescent gas-light mantle and chimney protector." Sept. 15.
21,296.—Kitson, A., "Fuel gas producers." Sept. 16.
21,329.—Arden, E. K. D., "Gas and oil motors." Sept. 17.
21,346-7.—Thornton, W. A., "Generation of acetylene gas." Sept. 17.
21,372.—Chardin, E. C., "Producing acetylene gas." Sept. 17.
21,464.—Windmüller, J., "Producing and burning acetylene gas." Sept. 18.
21,467.—O'Donnell, P. & D., "Glass chimneys of gas and oil lamps." Sept. 18.

Wages of Lamplighters at Newcastle.—The Watch Committee of the Newcastle Corporation at their last meeting discussed an application from the lamplighters for an advance of 1s. per week; and it was agreed to grant their request as from the end of the present financial year in March next. If the Council confirm the resolution of the Committee, the men will have practically obtained all they asked for at the commencement of the present year, when the action they took caused much inconvenience in the city.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Assessment of the South Metropolitan Gas Company and the Price of Gas.

Sir,—The interesting experiment of differential prices in our district will not be tried; a reasonable settlement with the rating authorities, who have met us very fairly, having been made. The settlement fixes the assessment for the remainder of the quinquennium—three years—at 12 per cent. on the receipts for the twelve months ending last June; the profit of that period having been just about sufficient to pay interest and dividend on capital.

The figures on which the judgment of the Court was given were those for the twelve months ending June, 1895, when the profit was very much in excess of the sum required for interest and dividend. The Court fixed the assessment at 15¾ per cent. of the gross receipts in the various parishes. We have, therefore, the satisfaction of feeling that all the parishes are now rated on an assessment at or nearly approaching 12 per cent. on the receipts. The crowded central parishes agreed at rather under that figure in 1895, and now the others have come practically into line with them; and what I have struggled for—equality all round—has been attained.

It is true that the receipts for the twelve months to June, 1897, are greater than those to June, 1895; and to this extent the parishes that have had twelve days in Court get, all things considered, a questionable advantage. An assessment equal to 12 per cent. on the gross receipts for the productive mains is, however, in my opinion too high, because I find that at this figure gas pays very much more in rates than any other articles used by the public.

All this trouble and expense to both sides, as well as the waste of time of the Court, has been caused by the practice of taking as the basis of assessment the accidental profits of the quinquennial year, instead of the actual profits divided. The profits earned by gas companies vary greatly. Ours in the last seven years range from £148,000 in 1890 to £355,000 in 1894. The last happened to be the quinquennial year. The profits divided, on the other hand, showed a constant small increase, going up from £280,000 in 1889 to £330,000 in 1896 by regular increments. The profits earned in 1888 were £308,000, and in 1889 only £202,000. This being the quinquennial year was against the rating authorities; and the assessments were slightly reduced. In 1894 the reverse was the case, and an enormous increase was claimed. Mr. W. Marshall, the Rating Surveyor, based his valuation in both cases on the divisible profits; and in his parishes there was no difficulty in settling the question. In the other cases how different was the result.

I enclose a copy of the notice to be sent to those consumers who received notice of increase.

Sept. 23, 1897. George Livesey.

[Enclosure.]

SOUTH METROPOLITAN GAS COMPANY.

Notice.

The Directors have satisfaction in stating that their representations to the Assessment Committees, based on the difference between the profits of the Company in 1895 and 1897, have been met by a reasonable reduction in the assessments. Under these circumstances, the notice to increase the price of gas is withdrawn. It will therefore stand, as before, at 2s. 3d. per 1000 feet.

By order of the Board,

September, 1897. Frank Bush, Secretary.

The Enrichment of Coal Gas.

Sir,—In the interesting communication appearing in the "Journal" under the heading of "Notes on the Enrichment of Coal Gas," tables are given (pp. 633 and 634) showing the enrichment value of carburine and benzene as determined by myself and other investigators; and attention is drawn to the extraordinary divergencies in the results obtained by different observers, and to my figures being absolutely discordant with the rest.

I would point out that the value of these tables would be greatly enhanced were the particulars also inserted of burners used, consumption of gas, &c., in the photometrical testing of the unenriched and enriched gas. Readers of the communication would then have an opportunity of selecting those results which, in their opinion, were obtained under satisfactory conditions. My tests were made so as to give the value of the enricher in candles, when using the standard argand burner with chimney fairly filled with flame, for both the unenriched and enriched gas; the results obtained being, of course, corrected for any deviation from the 5 cubic feet rate.

Had my experiments been made by the irrational method (not infrequently pursued) of adhering to the 5 cubic feet rate of consumption, my results would have varied from the figures given up to a value of about four times as much—depending upon the quality of the unenriched gas and the extent of the enrichment. The standard argand burner, as I have many times pointed out, greatly depreciates the quality of a poor gas when it is consumed at the 5 cubic feet rate; and consequently the poorer the unenriched gas so tested, the greater the *apparent* value of the enricher.

When flat-flame burners are employed, equally anomalous results may be obtained. Indeed it is as easy to show that an enricher possesses no enriching value at all, as it is to show that it possesses many times its true value, if unsuitable burners be selected for testing either the unenriched or the enriched gas. Methods by which the value of enrichers may be consistently obtained with flat-flame burners are, in my opinion, given in the following papers: "The Comparative Value of Various Oils for Enriching Coal Gas," read before the Incorporated Institution of Gas Engineers in 1892,* and "Acetylene and its Enrichment Value," read before the Institution in 1895.†

I observe that the enrichment value of benzene obtained by Mr. Lewis

* See "Journal," Vol. LIX., p. 906. † *Ibid.*, Vol. LXV., p. 1067.

T. Wright, an investigator with whom I am glad to be in agreement (see "JOURNAL," Vol. LXV., p. 427), is not given in the table.

Birmingham, Sept. 24, 1897. CHARLES HUNT.

Suggested Examinations in Gas Distribution.

SIR,—The City and Guilds of London Institute has done a great work in promoting technological training; and certificates granted by the Council are recognized everywhere as evidence of ability. One trade, however, has not received the amount of attention it appears to merit, as being of daily increasing importance to the general public; and that is the domestic distribution of coal gas for lighting and heating purposes. Now that the gas industry has reached the important position it at present occupies, surely it is time that gas-fitting should be raised to the dignity of a separate trade. Indeed, for all practical purposes it is so regarded, though some of the men to whom the work is entrusted are certainly not competent to carry it out in a skilful manner. What gas engineer has not encountered evidence of gross ignorance of the very rudiments of house fitting? It may be urged that the plumbing certificate covers nearly the whole of the ground, and that the one granted for gas manufacture includes the remainder. Even so. But it must also be borne in mind that it forms the tail of both subjects; and the information acquired by candidates for either is often crammed at the last, "because one might be asked the question, and is supposed to know these things." Or granting that the knowledge is not superficial, the plumber, except in jobbing shops, does not do gas-fitting, and therefore has no opportunity of carrying his theoretical knowledge into practical effect; while the gas manufacturer's work ceases on entering the consumer's premises.

Another class, to whom the preparation necessary for such an examination would be beneficial, is the gas company's fitter. In his official capacity, he is not required to be a plumber; yet he is required to fix meters, stoves, water-heaters, and even gas-engines. He must also be competent to attend to consumers' complaints; and though he is not called upon to remedy bad fitting, he is supposed to know sufficient to advise alterations for improvement, and locate defects. Another important branch has recently sprung into existence for the supply of automatic meters and fittings. Anticipating the objection that inspectors are provided (who, by virtue of their occupation, are duly qualified to advise on matters concerning the efficient application of gas), those who are acquainted with the working of a large district will realize that it is not possible for an inspector to give attention individually to the several thousand consumers who are under his care. A general supervision, with particular attention in special cases, provides plenty of occupation for that official.

As a rough suggestion for a syllabus for the proposed course, the following headings may be quoted: Mains, services, carcasing, meters (dry and wet), automatic supply devices, effect of pressure, governors, burners, jointing lead and compo. pipes, leakage, treatment of complaints, cooking and heating stoves, geysers, gas-engines, gas-furnaces, and general trade applications; also photometry, lighting effect, with consideration of working angles, street lighting, and the theory of the incandescent light. It might not be advisable to adopt two stages, or to have a practical examination. There is scarcely enough variety in manual processes to render the latter necessary; proficiency in making a gas-tight joint under varying conditions being the *desideratum*.

Sept. 20, 1897. FITTER.

Beyrout Water Company, Limited.—The concession of this Company, which has nearly expired, has been extended for a period of 40 years.

Incandescent Gas Lighting in Switzerland.—The Swiss Incandescent Gas-Light Company, of Zurich, report a profit of £5050 for the financial year 1896-7; and they are declaring a dividend of 15 per cent. per annum—the same as in the preceding year.

Sales of Shares.—At a public sale at Hastings last week, eight £20 shares in the Hastings and St. Leonards Gas Company realized from £50 to £50 5s. each. Some £20 "B" shares in the Colchester Gas Company have lately changed hands at prices ranging from £35 to £35 15s. each; and some £10 shares in the Huntingdon and Godmanchester Gas Company, at an average of £21 10s. apiece. Last Thursday, some £10 preference shares in the Wisbech Lighting Company were sold at £15 2s. 6d. and £15 5s. each; some £10 original shares in the Water Company fetching £16 12s. 6d. and £16 17s. 6d. each, and some £10 ordinary shares, £13 apiece. At Tunbridge Wells last Friday, good prices were realized for shares in the Tunbridge Wells Gas Company. Parcels of consolidated ordinary shares, paying 11¼ per cent., fetched £287 10s. per £100; consolidated "B" stock, paying 9 per cent., selling for £302 per £100, as also did consolidated "C" stock paying 8 per cent. These are the highest prices yet given for these stocks.

Devonport Corporation and the Water Supply.—At a meeting of the Devonport Town Council on Thursday, it was unanimously decided to promote a Bill next session for the purchase of the undertaking of the Devonport Water Company. Mr. H. Whitfeld said the Committee who had been considering the question had no knowledge of what the works would cost; but whatever value the Company set upon the property, the Corporation would not be called upon to pay more than its proper worth as fixed by arbitration. Something would be added for compulsory purchase. But, on the other hand, they looked forward to an enormous extension of the boundaries of the borough and a great growth of the population; and if the Corporation stepped in now, the increase in the water supply would be for the benefit of the town. Dr. J. Rolston said they ought to know what prospect there was of accomplishing their purpose. He was afraid they would be unable to prove any neglect on the part of the Company. The Town Clerk (Mr. J. Pilling) said that last year Parliament directed the transfer of a water-works to a local authority on the sole ground that the inhabitants of the locality were almost unanimously in its favour. Devonport would not rest its case on this ground alone. Still, in promoting the Bill for the acquisition of the water-works, he should communicate with the Water Company, with the view to a friendly arrangement being made.

MISCELLANEOUS NEWS.

THE AMBLESIDE GAS-WORKS ARBITRATION.

The proceedings in connection with this arbitration took place, at the Surveyors' Institute, London, in July last; but we have deferred the publication of a report of the evidence submitted to the Umpire and Arbitrators until the issue of the award. The object of the arbitration was to determine the price to be paid by the Ambleside District Council to the local Gas and Water Company for their undertaking. The Umpire was Mr. CHRISTOPHER OAKLEY; the Arbitrators, Mr. CORBET WOODALL for the Company, and Mr. STEPHEN SHAW for the District Council. The Umpire (as reported a fortnight since) has fixed the price of the gas-works at £17,080, and that of the water-works at £11,281. There are outstanding mortgages of £2000; so that the sum to be provided will be £26,361, *plus* £1350 for undivided profits to Midsummer last, and a retiring allowance for the Secretary and Manager (Mr. T. Mackereth).

Mr. CRIPPS, Q.C., and Mr. RICKARDS appeared for the Company; Mr. BALFOUR BROWNE, Q.C., and Mr. BLENNERHASSETT, Q.C., for the District Council.

Mr. CRIPPS, in opening the case, explained that in 1894 the Company applied to Parliament for statutory powers; but the Bill was thrown out on the understanding that the District Council should become the purchasers of the works. In the following year, the Council obtained the Act which empowered them to acquire the undertaking. In this measure, it was provided that, in the event of arbitration, the Umpire was to state separately the purchase-money for the gas and water works. This was convenient, because generally different periods of purchase were given in the one case and in the other. A line had also to be drawn as to the date when the money was to be paid, and the undertaking vested in the new body; and then the question arose as to dealing with the assets and liabilities of the Company at that date. If there was any difficulty about this, he would have to say what in his view would be the proper method of dealing with the matter; but he did not apprehend there would be any trouble. Section 6 of the Act indicated that this was a sale and purchase not by agreement, but by compulsion; and this, of course, gave the Company the 10 per cent. over which, in these cases, they sometimes fought. There was a matter of principle to which he also wished to refer. A theory prevailed some years ago that there was a difference in estimating the value of these undertakings according to whether they were dealing with a statutory or non-statutory company, because it was then thought that the chance of competition was greater in the case of a non-statutory company. This illusion had been destroyed, because, whether a company was statutory or non-statutory, Parliament neither encouraged nor allowed competition without there had been some failure of duty on the part of the Company. Under the Public Health Act, theoretically a local authority had certain rights of water supply; but only a madman would suggest competition in a place like Ambleside, as it would be ruinous to both the company and the ratepayers. The principle had always been maintained that competition under these circumstances was wasteful, and that the people who had invested their capital in these undertakings at a time when the local authorities did not take the same attitude that they did now, should have a proper sum given them in compensation. In this instance, both as regarded the gas and water, the Company were in a secured position; and they were entitled to the highest multiplier that was applied in cases of this kind. They possessed the two elements which secured the income—the population and the rateable value were growing rapidly; and the Company had ample room and resources to meet the increasing demand which would make the concern more valuable. Learned Counsel then proceeded to quote the main figures on which the Company's case was based; but these will be found in the following evidence.

Mr. *Samuel Wood* (of Messrs. Alfred Lass, Wood, and Co.) was first called; and he handed in a report and statistics which had been prepared by him in conjunction with Mr. Lass. He stated that the Company was registered on Aug. 11, 1866, with a nominal capital of £8000, which was afterwards increased to £12,000. Respecting the profits, he explained how he arrived at what was termed the "corrected profit" of £855 19s. 5d. for the gas undertaking, and £448 5s. 11d. for the water undertaking.

In cross-examination, witness said £855 was the gross income from the gas undertaking, after deducting working expenses; and it was the sum available for dividend and interest. Asked as to whether the deductions for working expenses were sufficient, he said he had only taken the entries in the books.

Mr. *Joseph Hepworth*, M.Inst.C.E., stated that he was first consulted by the Company in 1893; and he had frequently inspected their works. The original site of the gas-works covered 3758 square yards; and the Company had added a plot of land measuring 690 square yards. The extended site would serve the Company for 80 years to come. As far as being outside the town was concerned, the site was a good one; but in other respects, it had disadvantages. It was situated 5 miles from the nearest railway, and was at a level of about 100 feet above the town. This was somewhat unfortunate, but unavoidable. As to the difficulty in regard to the distance from the railway, he had heard that a light railway was in contemplation. The buildings (which were well constructed) consisted of a retort-house, coal-store, a purifier-house, a sulphate of ammonia house, and two excellent cottages, with the other buildings usually found on a well-appointed works. In the retort-house, there was a bench containing four ovens and fifteen retorts, which were capable of producing 75,000 cubic feet per day. The present daily maximum make was 40,000 cubic feet. Therefore the retort power was 100 per cent. in excess of the maximum output. By rearranging the retorts, they could be made to produce 100,000 cubic feet per day. The capacity of the coal-store was about 140 tons, which was equal to (say) six weeks' supply. There were two purifiers, and ample space in the house for two others. The sulphate-house was a large building, and contained the requisite apparatus for producing that article. Generally speaking, the manufacturing plant was in excellent order, and was equal to the production of 50,000 cubic feet of gas per day, or 25 per cent. above the present maximum output. The retorts, engine and exhauster, and station meter were in excess of 50,000 cubic feet per day; but deficiencies existed in the

condenser, scrubber, and storage. To put these right would not involve a large outlay; and it was to make improvements in these respects that the Company went to Parliament in 1894. The total length of the gas-mains was 14,414 yards; and the diameters ranged from 6 inches to 2 inches. The capacity of the two existing holders was 34,000 cubic feet. He had suggested the telescoping of the holders, which would increase the storage to 60,000 cubic feet. There were 260 service-pipes and meters connected; and about 51 cooking-stoves fixed. The number of public lamps was 81. The quantity of gas manufactured in the year ending June, 1896, was 9,637,400 cubic feet. Of this 7,599,168 cubic feet were sold; and 430,400 cubic feet used at the works—leaving 1,607,832 cubic feet unaccounted for. The percentage of loss was 16·69; but he preferred to state the quantity unaccounted for per mile of main. In this case, it was 196,000 cubic feet, which was certainly below that of many of the best managed works in the kingdom; the average being above 300,000 cubic feet per mile. There had been a regular annual advance in the amount of gas sold during the last six years; the increase in 1896 compared with 1891 being 2,311,315 cubic feet. This was equal to 7·27 per cent. annually; and at this rate the consumption would double itself in about ten years. He should expect this growth not only to be maintained, but exceeded for some time to come; and consequently the profits would increase. The average illuminating power of the gas was 18 candles; and the price ranged from 5s. 8d. to 5s. per 1000 cubic feet, with 5 per cent. discount if the account was paid within a month. For public lighting the charge was 5s. per 1000 feet; and for cooking, heating, and motive power, 4s. 2d., with 5 per cent. discount. For the gas supplied under the prepayment system, 5s. 8d. was charged. The average price received for gas last year was 57·35d. per 1000 cubic feet. Having regard to the fact that Ambleside was a considerable distance from the coal-fields, and five miles from a railway station, this was, in his judgment, a reasonable price. The capital expended on the gas-works was £7806; and on the water-works, £5138—the balance of unexpended capital being £1056. This made the total share and loan capital £14,000. In 1879, the Company had a reserve fund of £1001; and they applied this to reduction of capital. If, therefore, this sum had not been deducted from the capital, they would have shown a total expenditure of £14,000. The capital employed in the manufacture of gas was £810 per million cubic feet made, and £1027 per million sold. Having regard to the condition of the district, this was reasonable. The prospects of the Company were never better than they were now; and it was unfortunate for them they were compelled to sell. He was quite persuaded that £855 19s. 5d. was a maintainable profit for the gas undertaking; and this, being multiplied by 26¾ years, brought out a total of £22,825 17s. 9d. From this, the following deductions should be made: For providing condenser, scrubber, and purifier, £300; for telescoping the gasholders, £600; and for governor and connections, £100. He also allowed £25 for repairs to the retort-house, and £300 for a house or office at the works. These totalled to £1325; and this deducted from the £22,825 17s. 9d. left £21,500 17s. 9d. Adding 10 per cent. for compulsory sale, made a total value of £23,650 18s. 9d. He arrived at the figure of 26¾ years upon the assumption of a dividend of 3¾ per cent. He took 3¾ per cent. because of the fact that he could not re-invest his money as a shareholder in similar undertakings to produce more than that. Turning to the water-works, he said the source of supply was in the Scandall Beck. The land upon which the works were built was leasehold. There were two leases, with 81 and 82 years to run. The supply was intercepted at a distance of about 1000 yards from the centre of Ambleside; and the drainage area covered 1500 acres above the point of interception. The supply was so abundant that no impounding reservoir was likely to be required during the term of the Company's leases. The works consisted of the intake, an aqueduct (9-inch pipes) 300 yards in length, and a covered reservoir of 300,000 gallons capacity. The ordinary water-level of the reservoir was 430 feet above the level of the sea; and this gave an available head of more than 200 feet throughout the greater part of the district. The water-mains varied from 9 to 2 inches in diameter; and their length was about 5½ miles. Since June, 1896, the number of services had increased from 396 to 464. The charge was 9d. in the pound on the rateable value; and the supplementary charges were very moderate indeed. Water for sanitary and street purposes had been supplied practically free to the District Council. Only £4 per annum had been charged as a kind of acknowledgment; and for hydrants, 10s. per annum, for which sum the Company maintained them in good repair. The quantity of water supplied in the district was something extraordinary. He did not think it could be less than 100 gallons per head per day; and in summer the total amount supplied must, of course, be considerably larger on account of the additional population. He attributed this heavy consumption to the consumers' defective fittings, and to the fact that the Company had no power whatever to control waste. The capital expended on the water-works was only equal to £55·66 per million gallons supplied; and water could be furnished to quite six times the present population without any further expenditure. The working expenses were exceedingly reasonable. For instance, last year they were only £115 7s. 11d., which was equal to 20·47 per cent.; leaving £448 5s. 11d. for profit on the trading. The working expenses were below any other undertaking of which he knew. From the profit of £448 5s. 11d. he should deduct an amount sufficient to redeem the entire cost of the works erected on the leasehold lands. The cost of these works was £2255 15s. 6d. To reproduce the whole cost of the works on the leasehold land in 82 years, it would be necessary to set aside £6 10s. 11d. annually. Deducting this, they had a maintainable profit of £441 15s. In this case, he had adopted the multiplier of 33 years; and this produced the sum of £14,577 15s. He added £3433 for the increased prospective value of the undertaking, on account of its undeveloped capacities. They had not only water, but works which would serve for six or seven times the population for a period of 60 to 80 years. The two sums named made £18,010. To this he added 10 per cent. for compulsory sale £1801, which gave £19,811. This made for the gas and water works together £43,462 14s. 9d. From this the mortgage debt of £2000 had to be deducted; leaving the total value of the undertaking at £41,462 14s. 9d.

Mr. Rickards, replying to the Umpire, stated that at the present time there was a sufficient sum to pay a dividend of 10 per cent.; and that would have to be ascertained, and added to the £41,462. The transfer was to take effect from the date of payment of the purchase money by the Council.

Cross-examined by Mr. Blennerhassett, witness admitted that about 1893 he made a valuation of the joint undertaking which amounted to somewhat above £24,000. He had not the figures with him, and so could not allocate the sum between the water and the gas. He should suppose that probably it would be about two-thirds gas and one-third water. The gas would be something like £14,000 to £16,000. He believed the Company did on that valuation offer to sell the undertaking to the Local Authority; but the works then were of much less value than now.

Mr. Cripps pointed out that in 1893, £24,000 was what the Company asked in the negotiation. But since then things had altered; and before this arbitration, for the purpose of settlement, they were willing to take £32,000.

Witness asked to be allowed to add that in 1893, the Chairman of the Company, as representing the Directors, said they did not want a big price, but only a fair one, on consideration that there was to be no opposition, that this was a friendly matter throughout, and that the Company were put to no trouble or expense. He did not think then that the £24,000 was the value of the works. Proceeding, he said the increase in the profit during the last four years had been very material; and this, together with the fact that money was cheaper, would account, he thought, for the difference in the value. Several points of difference between a statutory and non-statutory company were suggested to witness, in regard to which he said that at one time he held there was a material difference; but he did not think so now, because it was well known that no opposition works could be commenced in, for instance, a place like Ambleside. It was true that in 1891 he read a paper before the Local Boards' Association, in which he said that the terms upon which a statutory company was transferred varied from 25 to 28 years' purchase of the maintainable profits; while when the undertaking was not authorized, the value was proportionately less, and had in several instances been taken at about 20 years. But six years had passed since the paper was written; and he thought most of them had changed their views on the subject. The sole difference he should now make between a statutory and non-statutory company would practically be the cost of the Act of Parliament; but the additional security the Act offered was worth the expenditure. Questioned upon the improvements he proposed at the gas-works, witness said he was quite certain they could be carried out for £1325. He could not say whether or not it was true that there had been little increase in the consumption of gas for lighting, and that the bulk of the increase had been for heating purposes, as he was not aware the figures were kept distinct. A number of questions were put to witness with the view of showing that the price charged for gas for heating —4s. 2d.—was unprofitable. For this purpose, he was taken back to the evidence he gave when the Company were before Parliament in 1894; but he pointed out that the figures he then submitted did not apply to the present cost of manufacturing gas. The net cost of coal and working expenses in 1896 was 33·70d. per 1000 cubic feet of gas sold; but this did not include the capital expenses. The profits per ton of coal carbonized in 1892 were 11s. 1·84d.; and in 1895, 19s. 0·63d. In 1894, the illuminating power of the gas sent out was 19 candles; and he was told that the average was now 18 candles. He was surprised to hear that on Jan. 26 last the gas was tested, and found to range at different times from 15·65 to 13·8 candles. He could not understand it; because the quality of the coal had been the same all through. He was not aware that there had been any alteration in the proportion of splint and cannel coal used since 1891. If they had reduced the candle-power from something like 19 to 15 candles, and had used less of the expensive cannel and more of the cheap coal, that would have reduced the working expenses; but he did not admit that this had been done. It would certainly not be reasonable to avail themselves of that kind of reduction of working expenses to increase the price of the undertaking to a purchaser; and he did not think the Company would dream of doing such a thing. As to his valuation of the gas-works, he knew that up to £2000 had been paid per million cubic feet of gas sold; but he could not call to mind a case in which £3000 had been paid. Nor at the moment could he give a case of a non-statutory undertaking having been sold for 26¾ years' purchase. The Colne Gas-Works changed hands at 23·7 years' purchase. He believed that was about sixteen years ago; and the presumption was that the undertaking would sell at a higher price now. In the Lockerbie case, the works changed hands at 25 years' purchase. The price asked in the Stirling case amounted to a decimal short of 24 years' purchase. The inhabitants considered the price an extravagant one; and they opposed the Bill in Parliament, with the result that it was thrown out. If the Stirling works had not been in the condition they were in, a higher price would certainly have been asked. Regarding the water undertaking, he did not know of a case in which the working expenses were so low.

Re-examined: The valuation of £24,000 which he made in 1893 was founded on the figures for 1892; and his present valuation was as nearly as possible 50 per cent. above that. The profit in 1892 for gas and water together was £825; while in 1896 it was £1305, which was more than 50 per cent. increase. The arbitration had not in any way influenced his valuation. The works at Ambleside were substantially built; and this could not be said of any part of the works at Stirling.

Mr. *Thomas Newbigging*, M.Inst.C.E., said he believed Ambleside was a place in which there would be an increasing demand for gas. He agreed with the previous witness that the gas-works were well constructed, but were deficient in the condensing, scrubbing, and holder power. A station governor was also required. His estimate of the amount needed for making the necessary improvements was £845; but it did not include a house and office for the manager. An addition of five retorts, with the regenerative system, would enable them to produce 130,000 cubic feet of gas. Judging by the small loss of gas per mile of main, the distributing plant was in good order. The average loss per mile throughout England was 330,000 cubic feet; while at Ambleside it was only 200,000 feet. The number of meters fixed was 260, including 33 prepayment ones; and there were 51 cooking-stoves in use. The growth in the make of gas from 1886 to 1896 had been 102 per cent. He had not the figures as to the increase in the consumption in that period; but during the five years ending June, 1896, it had been 43¾ per cent., or an average of 8¾ per cent. per annum. There was every indication that this increase would be maintained. Taking into account the circumstances of the Company, he did not consider the price of gas high. As to the cost

of production, the Company had to pay an average of 14s. 3d. per ton for coal at Windermere, and then had to haul it a distance of five miles, at a cost of 3s. 4d. per ton. The expense of putting it into store was 3d. per ton; so that the total cost was 17s. 10d. The capital expenditure was reasonable, considering these were small works, and that the whole of the material had to be hauled a long distance. Respecting the water supply, it was abundant for many years to come; and all that was needed was to stop the terrible waste that was going on in the district. The Company sought to remedy this in the Bill they promoted in Parliament some three years ago. Regarding the value of the undertaking, he did not think the fact that the Company was a non-statutory one made much difference. He found that most people were coming round to his view on this question. He did not think it made a difference of more than two or three years' purchase, because a non-statutory company had very substantial protection. It would not pay another company to set up opposition works in a district of this character. His valuation of the gas-works was £21,981; and of the water undertaking, £16,687. He added 10 per cent. for compulsory sale (£3866), and deducted the mortgage loan of £2000, which left £40,534.

In cross-examination by Mr. Balfour Browne, witness said the works were not old, as they were well maintained. The plant which was deficient did not constitute the whole of the works; the retorts being the most expensive part. The purifiers were capable of dealing with 80,000 cubic feet of gas per day; so that they were equal to more than the present output. The works should certainly have a margin of about 15 per cent.; but the whole of the plant was not capable of producing the present consumption of gas with that margin. The retort-house was equal to a much larger make. He did not think the entire increase in consumption was to be ascribed to the cooking-stoves. His view was that it was an unfair thing for a person who used gas for lighting to have gas for cooking supplied at a much lower figure. The proportion of stoves to meters—1 to 5—was a large one; but he did not think this had exhausted the demand for gas for cooking. The percentage of unaccounted-for gas (16·69) was rather high; but it was not very high for a sparsely populated district like Ambleside. As a general principle, it might be taken that, as the consumption increased, the percentage of unaccounted-for gas decreased; but the facts were the reverse in this instance. He did not think the electric light was progressing in the district; only two or three of the large places having adopted it. When giving evidence on the Company's Bill in 1894, he admitted that, if the Company obtained statutory powers, it would add five or six more years to the purchase value. Their ideas on the subject had grown since then; and he now put it at two to three years. A non-statutory company had protection in this way—that a local authority could not compete against them, because they would not be allowed to do so without purchasing the works. He agreed that a local authority had power to obtain water for their own purposes.

Re-examined: If a local authority did supply themselves with water for public purposes, it would be no great loss to a water company, because the price of water so supplied was always low—particularly in this case, where they only charged £4 per annum. Concerning the leakage of gas, he found that in the case of The Gaslight and Coke Company, the percentage was 4·94; and per mile of main, it was 535,911 cubic feet. The percentage for the South Metropolitan Gas Company was 5·3; and per mile of main, 538,501 cubic feet. In the case of the Commercial Company, the percentage was 7·04; and the unaccounted-for gas per mile of main, 608,237 cubic feet. Therefore, the Ambleside Company compared very favourably with 200,000 feet per mile of main. The large percentage of loss at Ambleside did not arise from defective mains at all; but for want, in the first place, of efficient condensation. Besides this the Company had no governor. The gas supplied for cooking was not unprofitable. The price was 4s. 2d. per 1000 cubic feet; and from this there was a discount of 5 per cent., which made the net charge 3s. 11½d. The cost of producing the gas would be: For coal, 1s. 5·08d.; purifying, 0·37d.; wages, 5·13d.; and depreciation of stoves, 0·41d. These four items amounted to 1s. 10·99d., and left 2s. 0¼d., as against 2s. 3d.—the actual profit on the whole of the gas sold. All the other fixed expenses would remain, whether the gas was used in the daytime or not. He had no reason to expect that the consumption of gas for lighting purposes would not increase in the Company's district simultaneously with that used for cooking and heating.

Mr. *Hepworth* (recalled) handed in a copy of the valuation he made in 1893. It showed that the value of the gas-works was then given as £13,628 9s. 2d.; and of the water-works, £9771. There was also a mortgage loan of £600, which made a total of £23,999 12s. 6d., exclusive of stocks and cash in hand. The present valuation included the stocks and assets, and everything except undivided profits.

Mr. *G. F. Deacon*, M.Inst.C.E., was examined as to the water undertaking. He said he thought it ought to have an additional value assigned to it by reason of its very full capacity as regards the works, the source of supply, and the probabilities of increasing population. He took the mean profit at the present time as not less than £457; and multiplying this by 30 years, gave £13,710. He should have put the multiplier at 33 years if it had been a statutory company. Then he added the increased value due to the power to supply a larger population; and he had calculated that £3220 would represent the present capital value of the extra profits for the next thirty years. This gave him a total of £16,930. Then he deducted a sum which, invested at 3 per cent. compound interest, would produce £2300 at the end of 99 years from 1880 in respect of the works on leasehold property—viz., £203. This left £16,727, to which he added 10 per cent. for compulsory purchase—making the amount £18,400 for the water-works.

Cross-examined as to the prospective extra profits, he said he could not give any special or definite reason why he anticipated an increase in Ambleside. The population throughout the county was increasing; and he believed people would visit Ambleside in future more than in the past. Regarding the works on leasehold land, witness was asked whether he was aware that the District Council had bought the freehold for £1300, and whether in his view it would not be a reasonable thing to deduct from the purchase-money the cost of converting this land into freehold. He replied that, as a matter of principle, he would answer "Yes;" but he could not make the same reply to the details, because he did not know the circumstances under which this sum was paid for the freehold.

Mr. Blennerhassett thought they could get rid of any difficulty with regard to this matter if Mr. Cripps admitted they were entitled to deduct the £1300 from the purchase-money, whatever it was found to be.

The Umpire said he should take it into consideration in making his award.

Mr. Cripps intimated that he accepted the £1300.

This concluded the case for the Company; and evidence was at once tendered on behalf of the Council, a report of which will be published next week.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

Half-Yearly Report and Accounts.

The accounts to be presented at the half-yearly meeting of the above-named Company next Thursday show that in the six months ending June 30 the gross receipts amounted to £130,099. The sale of 574,379,900 cubic feet of gas to private consumers, at prices ranging from 3s. 5d. to 4s. 6d. per 1000 cubic feet, produced £101,689; the gas used for public lighting and sold by contract brought in £6426; rental of meters, £3077; residuals, £18,762; and rents and transfer fees, £145. The expenditure amounted to £94,181, of which £72,144 was for the manufacture of gas (coal, cannel, and oil costing £50,726), £8286 for its distribution, £3440 for rates and taxes, £5586 for management, and £2943 being abatements and allowances. The amount carried to the profit and loss account is £35,918; and the balance available for distribution, including £759 brought forward, is £31,512. The Directors recommend dividends at the rates of 10½ and 7½ per cent. per annum on the respective shares, to pay which it will be necessary to take £2055 from the reserve fund, leaving £45,280 standing to the credit of that fund. The bulk of coal and cannel carbonized was 68,662 tons; and there was, in addition, an unstated quantity of oil spirit used. The make of gas was 687,587,000 cubic feet, of which 65,346,000 cubic feet are unaccounted for. The total sold was 612,826,000 cubic feet—an increase of 35,000,000 cubic feet as compared with the corresponding period of last year. The estimated quantities of residual products are given as follows: Coke, 83,333 chaldrons; breeze, 10,332 chaldrons; tar, 632,013 gallons; ammoniacal liquor, 1,494,622 gallons.

OTTOMAN GAS COMPANY, LIMITED.

The Half-Yearly Meeting of this Company was held last Tuesday, at the London Offices, 9, Queen Street Place, E.C.—Colonel James Le Geyt Daniell in the chair.

The Secretary (Mr. T. Guyatt) having read the notice convening the meeting, the Directors' report and the accounts, to which reference was made in the "Journal" for the 14th inst., were taken as read.

The Chairman, before proceeding to the business of the meeting, explained the circumstances under which he was presiding. He said that their late Chairman (Mr. Dove) found that the pressure of years incapacitated him from attending the meetings as often as he would like; and therefore he had tendered his resignation as Chairman. His (Colonel Daniell's) colleagues thereupon paid him the compliment of electing him to the position. At the last meeting, he referred to the retirement from the Board of Mr. J. Orwell Phillips, and also to the services he had rendered to the Company. As most of the shareholders were aware, Mr. Phillips had since died; and, though he was not then a Director, he (the Chairman) felt it only right he should place on record how very much they all regretted his death, more particularly as it occurred so soon after his resignation. Regarding the working of the half year, he thought the shareholders might congratulate themselves upon the state of the Company as shown by the accounts, especially when they took into consideration the troubles Turkey had had to pass through. The country, having had a war forced upon it, had naturally to derive its resources from every part of its dependencies. The Company's business was in one of the most important and valuable cities of the country; and therefore it might have been expected that it would suffer materially. The public lighting had been reduced somewhat; but, on the other hand, the general consumers had increased. This was very satisfactory. As soon as peace (the preliminaries of which were signed only the previous Saturday) was absolutely settled—and he thought they might look upon it as settled—it was only fair to anticipate that the prosperity which must follow would, to a certain extent, be shared by the Company. The Directors did not propose to carry anything to reserve this half year. The cost of coal had not been more; but it had been affected by the rise in freights. With the exception of the Directors' fees, to which he drew attention at the previous meeting, and which now stood at £300, there was really no other item which it was necessary to touch upon.

Mr. Stephenson R. Clarke seconded the motion.

Mr. A. Skaife said he noticed that at June, 1896, the cash in hand and bills amounted to £8954; in December last, to £9270; and now they had got down to £7397. Sundry debtors, too, were heavier.

Mr. W. Hughes spoke approvingly of the increase in the Directors' fees, and suggested that the Board should take into consideration the question of raising the remuneration of the Secretary.

The Chairman, replying to Mr. Skaife, said, on the other side of the account, it would be seen that the bills payable had been reduced from £5308 this time last year to £3507; and this would account for there being a less amount on the reverse side. The explanation as to the sundry debtors being heavier was that the resources of the place had been heavily drawn upon for the war; and therefore the people were not so well off for ready money. The matter had not escaped the attention of the Directors nor of their Manager (Mr. John Gandon), who was extremely active in looking after the Company's interests. As to Mr. Hughes' suggestion, the Directors had not overlooked the matter.

The motion was unanimously carried.

On the proposition of the Chairman, seconded by Mr. Charles Gandon, a dividend was declared at the rate of 7 per cent. per annum on both classes of shares.

Mr. R. L. Andrews moved, and Mr. J. L. Chapman seconded, a vote of thanks to the Chairman and Directors; and it was heartily agreed to.

A similar compliment was paid to the officers and staff.

SHREWSBURY GAS COMPANY.

Criticism of the Proposed Electric Lighting Scheme.

The Annual General Meeting of the above-named Company was held last Wednesday—Mr. J. Spencer Phillips in the chair.

The Secretary and Manager (Mr. W. Belton) having read the notice convening the meeting, the Directors' report was presented. It stated that the available balance of profit was £2443; and the Directors recommended that the authorized dividend should be declared. This (after deducting the interim dividend paid in March) would absorb £2427; leaving a balance of £16 to be carried forward. There had been an increase of 8·64 per cent. in the consumption of gas during the year, partly attributable to improved distribution. The unaccounted-for gas had been 6·95 per cent., being affected by the main-laying undertaken by the Company and by the extensive sewerage operations in progress in the borough.

The Chairman, in moving the adoption of the report, stated that during the past year they had carbonized 683 tons of coal more than in the preceding twelve months; but whereas the increase in that respect was only equal to about 5·20 per cent., they had manufactured 13,960,000 cubic feet more gas, or equal to an increase of upwards of 10 per cent.—a better result of nearly 5 per cent. The improved results to which he had referred were principally due to the retorts and the plant being thoroughly re-organized, and also to the careful supervision of all the details. Turning to the revenue account, they had sold 8·64 per cent. more gas than in the previous year. This he attributed partly to the new main, partly to the season being colder and darker, and partly to the increased favour with which gas was looked upon by the public for heating and cooking purposes. Dealing with the various items of the account, he pointed out that the rates and taxes had increased by £127. The whole of the expenditure was £883 19s. 6d.—a very formidable item. It was nearly 20 per cent. of the amount they paid altogether in dividend, and it worked out to 1½d. per 1000 cubic feet of gas sold. The total of the revenue account was £1557 more than last year; and the expenditure had increased by £1502. Turning to the general balance-sheet, there was one item to which he must call attention. It was the first time since 1881 that they had no suspense account whatever. During that time they had spent no less than £15,000 in re-organizing and renewing their works. Passing on to the question of the public lighting of the town, he acknowledged that it was not all it should be. But what was the reason? It was owing to the small number of the lamps. The Corporation allowed only a 4d. rate for lighting, though twice it had been, he thought, 5d. He believed he was correct in saying this was a lower rate than that of almost any town in the kingdom. The Gas Company had 36½ miles of mains, 34 of which were in the borough. There were 660 lamps. This would give, he thought, an average of about 91 yards between each lamp. It was impossible, with the ordinary gas system, to properly light the town with that distance between the lamps. They were, however, prepared, and they had stated so, though he did not know whether or not their offer had been understood or considered, to give the town treble the amount of the existing light by means of incandescent lamps, without a penny additional charge to the ratepayers. If a somewhat higher rate were allowed, the number of lamps could be increased; and he was perfectly satisfied a most efficient lighting of the town could be effected thereby. They had all seen the proposal afoot for the purchase of the electric light works by the Corporation, which was brought forward at the last meeting of the Council, when Mr. Deakin, the Chairman of the Gas, Water, and Lighting Committee, introduced a motion for negotiations to proceed in the matter. The Company, as manufacturers of gas, had not a word to say on the subject; and it was immaterial to them whether their rivals were a private company or the Corporation themselves. They would maintain a friendly rivalry in competing with them; and, under any circumstances, he did not anticipate that the Company would have to "take a back seat." But there was another standpoint from which they, as a Gas Company, should (and it was their duty to do so) look into this matter. Most of them in their individual capacity were ratepayers. But perhaps they would be surprised to hear that the Company were the largest ratepayers in the town, with the exception of the Railway Companies; and as such he thought they were bound to examine and criticize most carefully any proposal made which might have a tendency to increase the rates. He would like, therefore, to make one or two observations on the statements brought before the Corporation at the meeting to which he referred. Mr. Deakin naturally brought forward certain statements, and tried to show the great advantages to be derived by the public and the rates from the use of the electric light; but he had utterly forgotten to put the other side of the case before them. Mr. Deakin told the Council that they should look at the action of other local authorities in the direction of electric lighting, and they could then benefit by their experience. He also told them that in places to which he would refer large profits had been made for the relief of the rates. He then went on to say that Liverpool, Taunton, Hastings, and Sheffield were among the towns which had allowed private companies to provide electric lighting, but had since bought, or were negotiating for the purchase of, the undertakings; and he afterwards added: "At Liverpool, £400,000 was paid for the undertaking. In the report before him, he saw that the works were laid down for one-half that sum, so that the Corporation of Liverpool had to pay £200,000 for the goodwill. In the first six months of working, the Liverpool Corporation made a gross profit of £21,918. About £4000 was devoted to the payment of interest on borrowed money, £6500 was placed to the sinking fund, and a surplus of £11,376 remained for the relief of the rates." Well, it should be remembered that the Liverpool undertaking had been working for thirteen years, and was paying a dividend of 6 per cent. Moreover, Mr. Deakin's figures were inaccurate. The capital expended by the Company was £264,711, and the price paid was £400,000; so that the goodwill, &c., stood for £135,289, and not £200,000. Next they came to Taunton. In referring to this town, Mr. Deakin had forgotten to tell them that Taunton purchased the electric lighting concern for about half the amount it cost. It cost £20,000, and was purchased for £9500. In spite of this, they had incurred a loss of £215 in their sixth year. At Exeter, the works cost £23,000, and were purchased by the Corporation for £7500; while at Bath, the works which had cost the Company £41,087 were sold to the Corporation for £24,533. Coming, as Mr. Deakin invited them, to places nearer Shrewsbury, he would refer to Stafford. The results at Stafford appeared to him (the speaker) to have been misstated. Mr. Deakin told them that "at Stafford, after the first year's working of the electric lighting undertaking by the Municipal Authority, and after deducting the amount due to the sinking fund, there remained a profit of £122; and judging by the way the light was being taken up in the town, there was every reason to believe the second year's working would show a much larger profit." What were the real facts? At Stafford the capital was £18,695. The first year's working showed a gross profit of £601, less interest £479 and sinking fund £424; or a net deficit of £302, instead of a profit of £122. Mr. Deakin in his calculation had entirely ignored the most important point of the sinking fund. At Walsall, they were told in the second year there would be a good profit; but he (the Chairman) must point out that on the first year's working at Walsall there was a loss of £445; so that there was no certainty that in the second year there would be a good profit. At Chester, they had had no return of any working results yet. He had only taken these towns because they were those specially chosen to illustrate the great benefit derived from the purchase of electric light undertakings; and, though Mr. Deakin said large profits for the relief of rates had been made in every instance, out of 46 returns which were published, only 22 had made any at all—and some of these very small profits indeed—while 24 had had losses. The towns and districts which had incurred losses were: Islington, £1836; St. Pancras, £1950; Bedford, £914; Bolton, £1054; Burton, £1578; Cardiff, £2023; Coventry, £1706; Dewsbury, £918; Dublin, £1339; Halifax, £801; Kingston, £1320; Newport, £1410; Sunderland, £701; Worcester, £1616; and Yarmouth, £616; besides others whose losses were under £500. Some of these were on the first year's working, some on the third, and some on the fifth. How, then, could the statement as to the making of large profits be justified? He would like them to look at the composition and financial position of the Company from whom the ratepayers were asked to buy the electric light undertaking. The capital was 2500 £10 shares, of which only 415 shares had been taken up, and £2 5s. paid on them; and if they added the 31 founders' shares, the total capital subscribed amounted to £942 5s. This at all events showed that the people in the neighbourhood had not implicit faith in the electric light. If they had, more subscriptions would be forthcoming to support it. As only £942 capital had been paid up, they might ask how the rest of the money had been provided. He found, on looking through the accounts, that some sanguine individual had advanced £16,272 on mortgage of a concern of which the paid-up capital was only £942, and which was making no profit whatever. He (the Chairman) had seen instances where £16,000 capital could acquire £900 on mortgage; but he had never before seen a capital of £942 able to obtain a mortgage for £16,000. They would be of opinion, perhaps, that the mortgagee was now a fortunate man, and must look with a great deal of pleasure at the prospect of the concern being lifted from his shoulders. With regard to the year's report, he saw there was a nominal profit of £112. When he said a "profit," he meant that the revenue exceeded the working expenses by £112. But no allowance had been made for interest on the £16,278, which at 5 per cent. would amount to £800, and at 4 per cent. to £640, and no amount was allowed for depreciation; so that they might judge what the deficit would be on the year's working. If the balance of receipts over expenditure this year should reach £600, as Mr. Deakin had said, even without the necessary allowance for depreciation, there would be a large deficit. He noticed that Mr. Deakin talked about the necessity for providing a sinking fund for £28,000. What this was for, he was not able to tell; but he should think if the Corporation proposed to acquire the undertaking at all, surely, in the interests of the ratepayers, it should be at a very much less price than the present valuation of a concern which was making a loss. Their own expert valued it at about £14,000, which gave a good idea of the depreciation of the works, which had cost £17,660 for two years' working. Mr. Deakin went on to give them an estimate of what the future of the Company might be; but the statements were so purely conjectural that it was hardly worth while to analyze them. Mr. Deakin hoped to get a profit of £1592 from the sale of 127,000 units; or, in other words, he proposed to make 14 times as much profit out of 5½ times as many sales. He (the Chairman) thought this simple statement would show how purely phenomenal and hypothetical the future was. As the Gas Company were nearly the largest ratepayers in the town, he considered it his duty to put those facts before the shareholders. If the Corporation were determined to acquire the electric light, he hoped they would do so at such a discount that would not prove to be a burden to the rates. He should imagine that the better policy would be to wait until the Company had attained a certain status and paid a reasonable dividend before they negotiated for the purchase of their undertaking. With the works now in hand for sewerage, and the contemplated improvement in the water supply, which were both most necessary and would add to the rates, but which they all welcomed, he thought the Corporation would show more wisdom in holding their hands for a time.

Mr. W. Beacall, in seconding the motion, said everyone present must be deeply sensible of the careful manner in which the Chairman had given his very lucid and important statement.

The motion was carried.

A dividend of 7½ per cent. (less 3½ per cent. interim) was then declared.

A vote of thanks having been accorded to the Secretary and Manager,

Mr. Belton, in responding, said the undertaking was in a thoroughly prosperous condition. Shrewsbury being a residential town, there were no manufactories to help them forward; but during the 18 years he had been Secretary, the consumption of gas had increased from 83 to 152½ million cubic feet, though the town had not grown in anything like the same proportion. There was every reason why it should continue to increase, notwithstanding the competition of electricity.

Votes of thanks were next passed to the Directors and Auditors, and the proceedings closed.

The Lighting of Bradford Suburbs.—The Electricity Committee of the Bradford Corporation, have adopted a recommendation of the Electricity Sub-Committee, to the effect that all public lamps at Heaton and Frizinghall supplied by the Shipley Gas Company be replaced by incandescent electric lamps wherever the necessary mains are available.

THE SHREWSBURY CORPORATION AND ELECTRIC LIGHTING.

As briefly mentioned in our "Electric Lighting Notes" last week, a Special Meeting of the Shrewsbury Town Council was held on Monday, the 13th inst., for the purpose of considering a report from the Finance and General Purposes Committee relating to the proposed purchase by the Corporation of the Shropshire Electric Light and Power Company's works. The Committee had had before them a report made by Messrs. Kincaid, Waller, and Manville on the subject, and had decided to recommend the Council to negotiate for the purchase, and to proceed to obtain the necessary power by Provisional Order. A motion to this effect was moved by Mr. T. P. Deakin, in a speech in which he endeavoured to demonstrate the advantages of the proposal by citing the examples of other towns. As his statements were sharply criticized by the Chairman of the Gas Company (Mr. J. Spencer Phillips) at the annual meeting last Wednesday, as reported in another column, we give Mr. Deakin's remarks. He commenced by saying that the Council had to look at the action of other local authorities on this question, and they could then benefit by their experience. The following towns, among others, had allowed private companies to provide electric lighting, but had since bought, or were negotiating for the purchase of, the undertakings: Liverpool, Taunton, Hastings, Sheffield, &c. At Liverpool, £400,000 was paid for the undertaking. In the report before him, he saw that the works were laid down for one-half that sum; so that the Corporation of Liverpool had to pay £200,000 for goodwill. This showed the importance of securing at once what was likely to develop into a valuable monopoly. In the first six months of working, the Liverpool Corporation made a gross profit of £21,918. About £4000 was devoted to the payment of interest on borrowed money, £6500 was placed to the sinking fund, and a surplus of £11,376 remained for the relief of the rates. To come to a place nearer to, and about the same size as Shrewsbury, he would tell them what had happened at Stafford. After the first year's working of the electric light undertaking by the Municipal Authority, and after deducting the amount paid to the sinking fund, there remained a profit of £122; and judging by the way the light was being taken up in the town, there was every reason to believe that the second year's working would show a much larger profit, and eventually the Corporation would have a valuable undertaking. At Wolverhampton, in the second year's working £988 was paid into the sinking fund; and there still remained a profit of £225. At Walsall, in the second year there would be a good profit. At Chester, they had recently gone in for the electric light; and from what he had heard, it was likely to be a great success. At Tunbridge Wells, on the first year's working a sum of £697 was paid into the sinking fund; and then there was a surplus of £887. Therefore, in every instance, after paying all charges and providing for contributions to the sinking fund, there were large profits available for the relief of the rates. Profits had been made in the following towns or cities: Bradford, £1948; Brighton, £5830; Dundee, £1127; Edinburgh, £2447; Glasgow, £2381; Hull, £1900; Liverpool, £11,376 (in six months); Manchester, after the third year's working, £16,812; Nottingham, £2280 in its second year; Portsmouth, £2277 in its second year—in fact, both large and small towns found electric lighting a profitable and remunerative investment. Messrs. Kincaid, in their report on the lighting of Shrewsbury, stated: "We feel fully justified in recommending your Council to purchase the undertaking of the Shropshire Electric Light and Power Company, assuming that the purchase can be effected at a price commensurate with the value of the plant belonging to them, and the goodwill so far earned by them." It was also pointed out in the report why the electric lighting could be managed cheaper and better by a local authority than by a private company. Naturally the residents would take a greater interest in it, and would more readily support what was practically their own than they would an undertaking in the hands of a private company. The works were well placed, and the present net value of the whole undertaking, without regard to goodwill or possible depreciation of land, was placed at £14,518. The amount spent on the buildings appeared to be moderate. At the time the papers were placed in the possession of Messrs. Kincaid, the Company had 61 customers in the centre of the town, and also supplied Shrewsbury School with the light. This year the profits would amount to £600. Assuming that the rate of progress would be the same as last year, they would have to provide light to the extent of 96,000 units at 6d. (£2400), and 31,000 units for public lighting at 3d. (£384). The cost of production would be 96,000 units at 2½d. (£1000), and 31,000 units for public lighting at 1½d. (£192). This would show a gross profit on the undertaking of £1592. This sum would be sufficient to pay interest to the sinking fund on £28,000 at 5 per cent., and leave a net profit of £192 available for the rates. The Corporation would become large consumers, and help materially to the prosperity of the concern. They could give a light of more than double the power of gas, and at a very much less cost. The report altogether fully confirmed the conclusions arrived at by the Committee. With respect to the financial position of the borough, it was very satisfactory, and they could well afford to take upon themselves the additional burden. But it could be scarcely considered a burden, for he had no doubt whatever it would prove a very remunerative investment. He hoped the present opportunity would not be overlooked. The Corporation gas bill for the three years ending Sept. 7, 1896, was £2342 10s. per annum. If they had the electric light, it could be supplied at actual cost price. He contended that the supply of water and gas, as well as of the electric light, ought to be in the hands of the Local Authority, who could manage such schemes for the benefit of the ratepayers, and the profits could go to the relief of the rates as far as possible. Mr. Barker said he agreed with the proposal to purchase the works; but he hoped the Corporation would not pay more than the market value to the Company. The Mayor (Alderman E. C. Peele) said they would take care of that. They could buy gold too dearly. The motion was carried unanimously.

Haywards Heath Gas Company.—The report presented at the half-yearly meeting of this Company last Wednesday showed that the balance to the credit of the profit and loss account for the half year to June 30, was £1759. Interim dividends at the rate of 10 per cent. per annum on the ordinary capital, and 7 per cent. per annum on the additional capital, were declared.

EXTENDING USE OF GAS IN INDUSTRIAL OPERATIONS.

The following article on the above subject, by Mr. F. H. Shelton, recently appeared in the "Engineering Magazine":—

There are about 1000 towns and cities in the United States wherein a total of approximately 60,000 million cubic feet of illuminating gas are annually manufactured. This gas is used chiefly for lighting, largely for domestic cooking and heating, and to a moderate extent for power purposes. A very considerable proportion of it, however, is used, and to the very highest advantage, in place of coal, as fuel for purely mechanical and industrial purposes. That probably a similar volume of various kinds of gases other than illuminating gas is also made and used wholly for industrial purposes, is not generally known, except to those whose business it is to be informed upon such matters. It is my purpose to point out the great number and variety of uses to which gas is now applied in the arts and manufactures. Within the limits of a magazine article it is impossible to go into the details of the relative operating cost of gas as compared with other fuels, or of the exact nature of all these increasing applications. A bare enumeration of the principal uses may, however, attract the attention of consumers of hard fuel, and lead them to appreciate more fully the advantages of gas fuel.

In the main, heat has hitherto been secured from coal, which, while effective, is relatively cumbrous and inconvenient to handle. If coal could be conveyed as a fluid, from a central point, through suitable distributing-pipes, to the various points of use, precisely as is water, steam, compressed air, oil, brine, or other fluids, the advantage, convenience, and desirability—disregarding cost for the present—would be obvious to every user. Assume this possibility, and that in many instances "fluid coal," so to speak, is cheaper than ordinary solid coal. From the industrial standpoint gas is simply fluid coal, or fluid fuel. Its use saves time, increases output, betters the quality of goods, eliminates ashes and heavy stoking labour, enhances convenience, and decreases expense. Small wonder, then, that it is extensively used, and that such use is constantly increasing.

As popularly understood, gas is an invisible fluid served from pipes, which in burning gives off both light and heat. There are, however, several well-defined kinds of commercial gas, differing widely in their characteristics and heating power. The principal ones are natural gas, illuminating or city gas, blue or fuel water gas, oil vapour in various forms, and producer gas. These five comprise all the gases used by manufacturers at large to any considerable extent for fuel. Typical analyses of these, exclusive of oil vapours, are as follows:—

— .	Natural Gas from Findlay (O).	Illuminating Gas (New York, Feb., 1897.)		Blue or Fuel Water Gas.	Soft Coal (Taylor) Producer Gas.
		Water Gas.	Coal Gas.		
Hydrogen . . .	2·18	32·70	48·10	50·90	12·00
Carbonic oxide .	0·50	30·20	7·60	44·50	27·00
Carbonic acid . .	0·26	2·40	0·30	2·45	2·00
Marsh gas . . .	92·60	16·80	36·50	—	2·50
Illuminants . .	0·31	14·40	4·30	—	—
Oxygen	0·34	0·04	0·40	0·07	—
Nitrogen . . .	3·61	3·10	2·80	2·08	56·50

Commonly spoken of as gases, these are really only combinations—practically definite and constant—of certain other gases, such as hydrogen, carbonic oxide, marsh gas, &c., as may be noted. As these component gases have each a well-defined heating value, the calorific power of any mixture of them (such as one of the above tabulated commercial gases) is readily determined by finding the nature and proportions of the component gases, and then aggregating their heating values. For instance, marsh gas is theoretically one of the greatest heat-producing gases; and natural gas, being principally composed of marsh gas, proves in practice to have the highest heating value of all commercial gases. It is obvious that the gas having the greatest heating value is, other things being equal, the most useful as fuel in mechanical operations. For comparisons of heating values, the British thermal or "heat" unit—"the quantity of heat that will raise the temperature of 1 lb. of water 1° Fahr."—is used. Natural gas has a value of about 1100 heat units to the cubic foot.

Natural gas is thus mentioned in order that its great heating power may be noted in figures, in comparison with the artificial gases of which more extended mention will be made, rather than merely to specify the uses to which it is applied. These uses of natural gas, while many industrially, are only those to which other gases can be applied. To the mind of the writer, the substitution for hard fuel of natural gas—intensely rich, costing but little, and conveniently supplied under pressure—is not a measure so progressive as to call for special commendation. It is certainly nothing in comparison with the skill and invention necessary to successfully and economically make and supply an artificial gas that advantageously displaces solid fuels previously used. To note the success that has been achieved in the use of artificial gas fuel is the especial object of this paper.

Illuminating or city gas, as made by the water-gas process, is the nearest approach to natural gas, in calorific intensity, of any of the manufactured gases. Made by the decomposition of water, it is chiefly composed of hydrogen and carbonic oxide, both of which gases have a high heat-unit value. When these are enriched by petroleum vapours to form an illuminating gas of 25 to 30 candle power, the resulting compound has an aggregate heat-unit value of 725 to 760 per cubic foot. This, the best commercial gas that man can make, is yet, it will be noted, but two-thirds as rich in heating power as natural gas, which so far man has been unable to reproduce on any commercial lines. Illuminating gas, as made by the coal-gas process, is gas distilled from rich bituminous coals in retorts, and is composed principally of hydrogen and marsh gas. As served to the public, its heat value is about 630. This carburetted hydrogen, however, whether made by the coal-gas or the water-gas process, is primarily made to give light. Richly laden with hydrocarbons and illuminants, its manufacture, purification, and distribution are expensive, and it cannot be sold by gas companies at a figure low enough to warrant its general use for heating in mechanical

or industrial operations, except where the cost of the heat involved in an operation is but a small proportion of the total cost. Its use is practically limited to light operations, where quality and convenience rather than volume of heat are essential. As the variety and number of such operations are very great, an enormous actual amount of city gas is, after all, used in commercial pursuits. One of the simplest of these applications is heating air. In ventilation, a current of air may be conveniently induced by burning city gas in a flue. In dyers' and cleaners' drying-rooms, in tobacco-seasoning rooms, in drying druggists' preparations, in the warming of lithographers' stones, &c., where a gentle heat is required, city gas is often the agent employed. The ripening of bananas by heat from city gas is common in the fruit trade. Equally common uses are the warming of liquids and melting of metals. In drug and grocery houses, gas is used for the heating of vats, kettles, &c. Plumbers so use it in the shop for melting lead and solder. In large printing-houses, it is used for keeping type-metal liquid in linotype machines, and for melting gelatin for ink-rollers, &c. In bottling-works, caustic solutions for cleaning bottles are kept hot by gas. The heating of irons is a common use. Both hand-irons and the rolls of power irons are warmed by gas in laundries. Branding-plates, irons for marking boxes or for stamping corks, and polishing-irons in various trades, are conveniently heated by gas. In the more strictly mechanical operations, hard soldering or brazing with the blowpipe is very extensively done with gas. In the jewellery and silverware working cities, of which Providence is typical, no mean proportion of the gas companies' output is used in the shops for the soldering, tempering, case-hardening, and annealing small tools, dies, cutters, &c., and in the hundred-and-one small operations requiring heat. In other directions the uses of city gas seem endless. Dentists use gas in bunsen burners for warming and for softening cavity fillings. Express companies use it for melting sealing wax—an apparently trivial, yet strictly typical, instance of its convenience. Gas-fired ovens for firing decorated china are common. The metallurgist uses gas in assaying. Small tools, springs, and scores of other metal objects, are made by gas heat. Hat factories use it in working felt; and shoe factories are large consumers. The filaments of incandescent electric lamps are baked by city gas in some instances. Bakers, confectioners, and restaurant keepers constantly use it in their industries. Bicycle makers use it for liquefying japans and enamels, and for brazing, annealing, hardening, &c. And so the list might be extended *ad infinitum*. One important use is in water-distilling equipments for use in private houses. The increasing demand for pure drinking water has brought into the market gas-heated stills for this purpose.

"Blue" or "fuel" water gas, or uncarburetted hydrogen, is the gas made in the first step of the manufacture of illuminating water gas. Composed almost entirely of hydrogen and carbonic oxide, it burns with a clear, blue, smokeless flame, and has a heating value of about 300 to the cubic foot. For mechanical purposes the gas is excellent; and it is simply and cheaply made. Commercially, however, the efforts to make and distribute it to the public at large for heating and industrial purposes have been unsuccessful. The reason is that, while blue gas is cheaper to make, its distribution costs as much as that of city gas, and, with its heating value but half or less (owing to the omission of the rich hydrocarbons or oil vapours), it has had to be sold at prices that have not repaid the makers. Even when sold at but half the price of city gas, it proves, on the whole, to be still as costly per heat unit, and is therefore limited, like illuminating gas, to small operations. The plant for making it, however, is comparatively simple, and in numerous cases manufacturers who could not afford to buy either city or blue gas of another have yet found it practicable and economical to put in individual plants to make their own supply; thus saving the cost of distribution and management, and the profit. They thus obtain a gas of good heating value, clean and complete in combustion, easily piped and applied, and low in cost. For practically all the industrial purposes for which city gas is used, and kindred ones where small or moderate volumes of heat are required, it gives satisfaction mechanically, and often secures a marked economy over hard fuels. Many private plants are using this gas. Probably its most typical use is in factories where metal working in many small forges is conducted upon a large scale, as in cutlery works, for which purpose it is an ideal fuel, vastly superior to coal. With coal there is the liability of unevenness of fire—causing irregularity of goods and loss of time. With gas, there are no ashes to handle; and if the forges or furnaces are lighted half an hour before starting, all will be at proper heat, and will continue so throughout the day. The work per forge or man is increased; time is economized, and "seconds" are decreased; cost is lessened, and the quality of the product usually bettered. In such work, the gas is principally used in ovens or furnaces, which are simply fire-brick lined iron boxes, mounted on stands of convenient height, for drop forging, annealing, tempering and hardening, case-hardening, die-making, &c.

Blue water gas has also been used for years in the largest saw and file works in the country, and particularly in watch-works. In the latter it has proved peculiarly suitable for delicate work, such as the annealing and tempering of fine springs, the enamelling of dials, the melting of gold, silver, and platinum, fine blowpipe work, &c. An interesting instance of the perfect suitability of gas fuel for many specific and unusual purposes in industrial operations is the use of blue water gas in one of the large New England bleacheries for singeing the nap from cotton cloth. The old way involved the use of a heavy copper cylinder, revolving over a bed of coals that kept it hot. The web of cloth was rapidly moved over it, from one roller to another, in such a way as to graze the hot copper roll, tangentially. The momentary contact burned off the nap, but was also liable to burn holes in the cloth by fuel specks carried up. The copper rolls were expensive, and warped and cracked in use, involving frequent re-surfacing. The substitution of gas has made a perfect arrangement. In place of the copper roll, a finely perforated gas-pipe is now used; a row of minute gas-jets supplies the requisite line of flame for singeing the passing cloth; and the cumbrous coal bed and cylinder are things of the past. Blue or fuel water gas has also been considerably used in foundries, iron, steel, and glass works, &c., for drying cores and flasks, plate welding and re-heating, crucible melting, and other purposes. Such industries, however, tend towards the use of large quantities of heat, and while mechanically the work may be well done, economically it approaches the conditions wherein producer gas may be the cheaper to use. For drop or trip hammer forging, or other small high-temperature forging or furnace work, in rivet, rod, and nail machines, in pipe bending, and operations of like magnitude, blue gas is at its best.

The use of oil gas, or some form thereof, owing to the cheapness of petroleum and naphthas, has in recent years made very considerable progress in the arts. The term is elastic. The true oil gas, made from petroleum vaporized in retorts by heat, is a chemically fixed illuminating gas of very high candle power, with heating value unnecessarily good, and too expensive for mechanical operations. As ordinarily understood, oil gas is merely a mechanical mixture of air with oil vapour. A current of air is passed over or through suitable volatile oils, picking up so much vapour that the transportable mixture will burn with a moderate light and high heating effect. The Springfield gas machine for lighting isolated country houses is an old, though perfect, type of this. The "gasoline gas" or "greased air" product, as so made and popularly named, has practically all the characteristics and advantages of a gas, and for the sake of convenience is so designated. Apparatus for making it has been so perfected of recent years by the use of proper mechanical devices for ensuring the uniformity and reliability of the product, that to all intents and purposes such apparatus has become the equivalent of individual factory gas-works suitable for affording a fluid fuel supply that will in many cases do the work done by natural, city, or blue gas, and with equal satisfaction and economy. Many such plants have been installed, particularly by metal-working establishments, isolated from the use of the so-called regular, or true, gases. While for a trifling amount of heat it would not pay to instal a plant for its manufacture, and for large operations the cost of any form of oil gas would exceed the cost of producer gas, there is yet an enormous field of medium mechanical operations for which it is suitable. Those applications already mentioned, involving high-temperature work on a small scale, are representative. The manufacture of sewing-machines and bicycles involves many specific applications. Dial and enamelled novelties, and gun work, where drop forgings are a principal feature, are other specific instances. Other applications are the manufacture of rouges and polishing compositions, the melting of copper in brass foundries, the manufacture of dentists' tools and of artificial teeth, muffle work, assaying and refining gold and silver, "sweep reducers" melting, and blowpipe work. The heating value of the various oil gases differs widely, depending largely upon the design and efficiency of the producing apparatus. As made from naphtha on a high grade, typical, modern machine, its value is about 300 heat units per cubic foot, or about the same as that of blue water gas.

Producer gas—by far the lowest in heating value of all commercial gases—presents a great contrast between its apparent relative worthlessness as compared with other gases, and its actual value for magnificent fuel economies in the largest manufacturing establishments, where its virtues are known and utilized. As ordinarily made, it has but one-fifth or one-sixth the heating value of city gas, or but 120 to 135 units per cubic foot. More than one-half of it is incombustible nitrogen. It is utterly useless for illumination. It is so dull and inert that it cannot be easily lighted or burned if it has become cooled, and lost the original sensible heat of the gas-producer. It cannot be used in small quantities, or conveyed through small wrought-iron pipes, or piped round a town, like other gases; and yet, despite all these apparent drawbacks, it is so cheaply and simply made, and so wonderfully effective when properly applied, that it has become the standard and only fuel in numerous industrial operations of the highest importance. These operations are at times spectacular, and always interesting. Limitations to the employment of producer gas are that it must be used as made, and on a relatively large scale, and at a point practically adjacent to the place of manufacture. These limitations are not objectionable in large manufacturing plants, and many, by installing producer gas, have practically secured all the advantages of cheap natural gas. In competition with rivals in the natural gas field, the ability thus to secure so cheap a gas fuel is often a point of extreme importance. Producer gas, made up of carbonic oxide, hydrogen, and nitrogen, is merely the blue gas of incomplete combustion often seen hovering over the top of domestic furnace fires. It is purposely made on a large scale from either buckwheat anthracite or cheap slack bituminous coals. Burned as it comes from the producer, it is so low in heating energy that it cannot be so used, except where moderate furnace heats are sufficient. By preheating the air used for combustion, however, by some system of recuperation, increased temperature can be secured; and if, by a full system of regeneration, the incoming gas and air are both preheated, as high a furnace temperature can be obtained as may be necessary for almost any kind of work. In the latter cases, moreover, for a given amount of work the quantity of coal necessary, converted into and used as producer gas, is often but one-half or one-third that which would have to be used if directly burned. For such reasons it is by far the cheapest fuel, where large quantities of heat and white-hot temperatures are required, as, for instance, in steel works. For years it has been a standard part of such plants for firing open-hearth furnaces, the heating of slabs and ingots, the melting of steel, &c. Glass manufacturers have also made most extensive use of it in both crucible and tank furnaces for melting purposes. That it is sufficiently efficient in this work, one can well believe when standing before a 60-feet furnace of molten glass, kept seething and surging under the radiant heat from a torrent of producer gas playing over it. In copper and silver mining districts, producer gas is largely used for smelting and ore roasting, with specially marked success as regards evenness of temperature and economy. The same is true for iron, zinc, and other ore roasting. The modern method of steel making requires the reduction of the 2½ per cent. of sulphur often present in the ore down to about ½ per cent., before going to the smelting-furnaces. The process consists of driving out the moisture by roasting; and producer gas is now practically the only economical way of accomplishing it. In the firing of pottery, terra-cotta, and brick kilns, producer gas is also extensively used. In the char-houses of sugar refineries, for the making of animal charcoal, it is becoming a staple fuel. In annealing-furnaces, in the manufacture of steel rope and malleable castings, and in brass and copper works, it is used in numerous instances. In ordinary gas-works it is often employed for firing the retorts. In illuminating water-gas manufacture, it is used for heating the chambers necessary to fix and make permanent the petroleum vapours used for enriching. For the manufacture of enamelled iron bath tubs, "granite," and other enamelled iron ware, it is peculiarly

adapted, giving a cheap and uniform heat for firing the muffle ovens which contain the goods. In short, wherever heat is required on a large scale, producer gas is generally the cheapest of all fuel, as well as wonderfully effective and convenient.

Enough has been said to show that gas, whether of one kind or another, is used most extensively for industrial purposes, and that its use is evidently a factor of the highest importance to progressive manufacturers alive to the necessity of securing the greatest economy and all possible advantages in their fuel operations. And yet, extensively as it is employed, and constantly increasing as its uses are, it is the opinion of the writer that the number of plants in which gas is so used does not constitute one-quarter of the number wherein it can, and ultimately will, be adopted to advantage. Whether it should be adopted or not by manufacturers not yet using it, need not be a matter of vague opinion. It is a matter susceptible of proof from practically exact figures. Hard fuel for any given heating operation now costs a certain amount. A given net amount of heating effect is secured from it, which can be closely calculated. The comparative cost of an equivalent net amount of heat secured from any one of the several commercial artificial gases mentioned is a matter of comparatively easy figuring to anyone familiar with the nature of the work, the cost of the gas or gas-making materials, and the relative heating values and characteristics of the several gases. A manufacturer paying large sums per annum for hard fuel who has not employed an expert to determine whether illuminating, blue water, oil, or producer gas can advantageously displace that hard fuel, is certainly running a large risk of conducting his business under a handicap of unnecessary fuel expense, compared with the possible lower cost of gas. In a surprising number of cases, the figures will show that economy can be secured by intelligently substituting one of the gases mentioned, to say nothing of an increasing amount of product, a better grade of work, and other incidental advantages almost invariably secured.

ELECTRIC LIGHTING NOTES.

The General Purposes Committee of the Carlisle Town Council have accepted tenders amounting to £15,959 for the plant required for their projected electric lighting works. One or two matters have been deferred for further consideration; and when these have been settled, the total will in all probability be increased to £16,700. Professor Kennedy's estimate amounted to £17,200—a sum which did not embrace arc lamps and mains, which are included in the contracts so far let.

Owing to the failure of the electric arc lamps in Dover last Sunday evening, the sea-front and the principal streets of the town were plunged in darkness. The extinction of the light also caused considerable interruption in the services at one or two of the churches, which are illuminated by electricity. As the incandescent lights were not affected, the electric festoons which were placed along the sea-front for decorative purposes during the season, but had been discontinued, were relit for the evening. Many of the shopkeepers along the main thoroughfares also drew up their blinds and lit the gas in their windows; thus making the darkness somewhat less dense. Nevertheless pedestrians found things very awkward.

Further complaints were made at Thursday's meeting of the Hampstead Vestry as to the lighting—or rather non-lighting—of the Finchley Road by arc lamps. Mr. Johnson stated that, when recently these eccentric orbs went out, he asked the Assistant-Engineer what arrangements were made to ensure the lighting of this main thoroughfare on such an emergency. His reply, which Mr. Johnson considered unsatisfactory, was that he believed the police had instructions to report these occurrences. Mr. Johnson therefore suggested that some method should be devised whereby the Surveyor should be immediately notified, and the gas-lamps lighted. The Surveyor assured the speaker that this should be done. As Mr. Johnson seemed inclined to argue the matter further, the Chairman (Sir Henry Harben) ruled that a subordinate official could not be censured in his absence, and that the Chief Electrical Engineer was the only person responsible. A member pointed out that a breakdown occurred in another part of the parish; and the Chairman of the Committee (Mr. Hall) admitted that the main was defective at that point. The Vestry's electric lighting account now shows a *debit* balance of more than £31,000.

The Electric Lighting Committee of the Portsmouth Corporation have had under consideration the desirability of providing additional plant to meet the demand for current beyond that which can be generated by the present machinery for the winter of 1898; and last Tuesday they recommended the Council to apply to the Local Government Board for sanction to the borrowing of £40,000, Of this sum about £21,000 will have to be spent next year; and the balance later on. In moving the adoption of this proposal, Alderman Ellis remarked that the delays caused by the present dispute in the engineering trade had given the Committee such a "shaking-up" that they felt they must now make provision for two years ahead. The extension of their business had been exceptional. He knew of no other installation in the Kingdom, except in London, where the growth was so great and rapid. It was felt, too, that to guard against a strike in the coal trade, their coalstore must be extended. He hoped the Council would allow the Committee to throw the tenders for the machinery open to the whole world, as he did not think the daily needs of the Portsmouth public should be at the mercy of strikes and lock-outs at home. The recommendation was adopted.

At their meeting last Tuesday evening, the Bermondsey Vestry considered the report of Messrs. Kincaid, Waller, and Manville, on the electric lighting of the district, and decided to apply for a Provisional Order. The experts estimated that the cost of supplying the streets in the scheduled area would be £15,635. They put the annual revenue at £2902, and the cost of maintenance at £1669. After paying interest, &c., they expected there would be a profit of £588. The usual arguments in favour of electric lighting were brought forward at the meeting. Mr. Cox, while moving that the Vestry should apply for a Provisional Order, admitted that electricity was dearer than gas; and Mr. Ball, whose amendment for postponement and a fuller report was subsequently defeated, pertinently pointed out that gas was very cheap—only 2s. 3d. per 1000 cubic feet—in Bermondsey. Mr. W. W. Tyler, J.P., the Chairman of the Vestry, summed up decidedly against the scheme; plaintively adding that the question bristled with difficulties, and he hardly knew what to advise. The motion was carried; but, as Mr. Pridmoor remarked, it does not pledge the Vestry to immediate action, for, if a Provisional Order is obtained, two years are allowed for the consideration of a definite scheme. This is well for the ratepayers' pockets.

Mr. Hawtayne has lately presented a report to the Weston-super-Mare District Council on the subject of the best means of carrying into effect their Provisional Order for electric lighting. He thinks that 8000 private lights of 8 or 10 candle power will be taken up within a comparatively short period after the starting of the works. But he is of opinion that only 4000 will be alight at one time; and therefore he advises that plant should be established capable of serving this number, *plus* the whole of the Promenade and other public lamps. He considers the low-tension system the most suitable. He reckons the cost of the works, without a dust-destructor, at the Town Yard (which site he advises) at £23,300; of similar works at the site offered by the Great Western Railway, at £24,600; of works with a destructor at the Great Western Railway, at £26,600; and of works with a destructor at the Statutory Hospital, at £30,600. He estimates the profits to be derived, and available for the reduction of the rates, from the adoption of the first scheme at £817; of the second, at £738 10s.; of the third, at £658 10s.; and of the fourth, at £379. He thinks a start should be made this year, in order to show the Board of Trade that the Council are in earnest over the matter, and that the Board need not entertain the proposals of any company or syndicate seeking to establish works in the town.

The Corporation of Dublin will shortly have to face a considerable outlay in connection with their electric light undertaking. During the present year there have been several mishaps with the cables, which have shown them to be in anything but a sound condition; and the Electrician in charge of the works (Mr. Mark Ruddle) has presented to the Electric Light Committee a long report on the subject. At the meeting of the Committee on Monday last week, the advisability of raising a sum of about £20,000, to be expended on improved cables, was considered; and it was decided to recommend a scheme for adoption. The feeling seemed to be in favour of obtaining a loan of about £100,000, and constructing a new power station at the Pigeon House Fort. In the meantime, it is intended to obtain estimates for the relaying of the present system with cables of the most improved description. It appears from Mr. Ruddle's report that similar trouble has been experienced at Blackpool, where the electric light station was erected in 1894 on similar lines to that in Dublin. During the past two years they have had many serious breakdowns of their rubber cables; the entire town being in darkness upon several occasions. The cause of failure was primarily due to the cables being badly handied when first laid, and to extra cables having been forcibly drawn into the iron pipes when there was not really space enough for them. The cables themselves also were not sufficiently thickly covered with rubber to preserve their strength when the outside braiding perished. These constant breakdowns decided the Corporation of Blackpool to make a complete change in their system of mains; and they have now nearly completed laying down paper insulated cables over their entire area. The arc lighting cables are being kept apart from those used for private lighting, as the same fault was found as in Dublin—that when one set of cables gave out, it invariably broke down the others. Trouble from defective cables has also been experienced at Leeds and at the House-to-House Company's Station at West Brompton. Mr. Ruddle advises that about 7000 yards of cable should be replaced without delay with a better kind. The alterations he indicates will mean a heavy expense; but he considers them to be absolutely necessary if they are to have in Dublin a reliable system of electric light supply.

Some months ago, when the question of lighting the City of Adelaide by electricity was before the Municipal Council, a memorial, signed by nearly all the principal ratepayers, was presented to the Mayor. It was pointed out therein that the question of electric lighting appeared to have blocked the way to a satisfactory arrangement being made with the proprietors of the existing system of illumination. Since December, 1889, no contract had been in force for lighting the streets of Port Adelaide with gas; and thus for this period the lighting account had been much higher than it otherwise would have been. About two years ago, the South Australian Gas Company offered to make a large reduction (about £200 per annum) in the charge, on the Corporation entering into a contract with them for a term. As this offer had not been withdrawn, the memorialists respectfully but strongly urged the Municipality to enter into such a contract with the Company, and thus save the ratepayers a large amount annually. This memorial was referred to the Electric Lighting Committee, who had just previously reported to the Council that they had received a letter from a gentleman in Sydney, stating that he was preparing plans for lighting the city; and they recommended that if the new Electric Light Company were prepared to sign the preliminary agreement already approved of on both sides, the tender be accepted, provided the contractors deposited £200 as a preliminary to £500 deposit. As the report was adopted, there was every prospect of the electric light scheme being carried through. This has, in fact, since been done—a definite agreement having been entered into with the South Australian Electric Light and Motive Power Company, who are to provide 24 arc lamps, each of 2000-candle power, and 66 incandescents of 50-candle power. The arc lights will be turned off at midnight, and their places then taken by 24 incandescents. These lights will replace 130 gas-lamps, having a total of about 2000-candle power. The electric lights will provide altogether 51,300-candle power. The cost of the electric light to the Corporation will, it is stated, be practically the same as for gas. The agreement makes provision for private lighting; and the maximum charge for current has been fixed at 8d. per unit. The contract is for ten years; and after five years the Corporation, by six months' notice, have the right of purchase on an arbitration basis.

The Montrose Town Council had before them, at their meeting on the 13th inst., a report by a deputation who have been visiting various places for the purpose of investigating the subject of electric lighting, with the view of introducing this system of illumination into Montrose in co-operation with Edmundsons, Limited. A draft agreement with the Company was submitted, and the Council were recommended to take steps for formally passing a resolution to the effect that they, as the Local Authority, should apply to the Board of Trade for a Provisional Order authorizing them to supply electricity for any public or private purpose within the area of the burgh—the Order to be afterwards transferred to the Company. Provost Mitchell, in moving the adoption of the report, said that by the agreement they would have the advantage

of getting the electric light started in their midst practically at once, or as soon as the necessary formalities could be gone through, and at a price which would compare satisfactorily with the present rate charged for gas in the town. Besides, the Corporation would have their streets and public buildings lit by the electric light at 4d. per unit. The Company guaranteed that it would not cost more than that; and they believed, as the Lighting Committee also believed, that it would be considerably less than the price they at present paid for gas. These were tangible advantages which the community and the Corporation would derive from the adoption of the agreement. In addition, they had the fact—by no means to be despised—that from £10,000 to £15,000 would be spent in the town in connection with the erection of the works. Moreover, power was given to the Corporation to take over the installation at any time they saw fit after the lapse of six years, on terms which the Committee were satisfied were the best they could reasonably expect to get from the Company. Taking it altogether, the Company could do the work cheaper than the Corporation; and, seeing that they were prepared to run all the risk, he failed to see why the Council should not approve of the agreement. Mr. Strachan seconded the motion. Mr. Mackie congratulated the Provost on the plausible way in which he had put the matter before the meeting; but he must say that he had no great sympathy with going into the agreement at that stage, principally because the advances that were being made year by year with electricity were so wonderful that he thought they should delay taking immediate action. He moved an amendment to this effect, which was seconded by Mr. Neilson. Mr. Murison thought that the matter should be left over for a couple of months, and be then made a test question at the elections. In the end, the motion was carried by 14 votes to 3.

THE CONGRESS OF THE SANITARY INSTITUTE.

The Annual Congress of the Sanitary Institute of the United Kingdom was opened in Leeds on the 14th inst. The members were received at the Town Hall by the Lord Mayor (Sir J. Kitson, Bart., M.P.); and the Council Chamber, in which the reception took place, was crowded by a distinguished gathering of leading authorities on sanitary science and hygiene, and experts in sanitary administration from all parts of the kingdom. There was no formal presentation of the delegates, who were welcomed in appropriate terms by his Lordship. In the course of his address, he said that the City Council and the inhabitants were grateful to the Institute for the service it had rendered in the past to the cause of the health and sanitation of the great cities of the country. He was quite sure the members would be welcome in Leeds, whose citizens were well known for their habits and practice of hospitality. They were proud of many things in their city. They were proud of the fine hall in which they were assembled. They were proud of their great water supply, knowing, as they did, that they gathered from the outlying moors a copious and continuous service of water, which had materially advanced the health of the inhabitants. They were proud also of their gas, which they supplied of the purest quality at the very lowest price—for the convenience of the inhabitants. Sir Douglas Galton, on behalf of the Institute, thanked the Lord Mayor for his cordial welcome. He said this was the sixteenth congress the Institute had held since its foundation a quarter of a century ago. The meetings had been held in all the important towns and cities of Great Britain, excepting Leeds. The exhibition of sanitary appliances which had been brought together in Leeds would certainly surpass in interest any previous exhibition that had been held; while in regard to the number of delegates from various county and city councils and other public bodies concerned with sanitary administration, this meeting would exceed all previous ones. The President (Dr. R. Farquharson, M.P.) also acknowledged the words of welcome spoken by the Lord Mayor.

The company then proceeded to the large hall of the Yorkshire College, where they had luncheon; the chair being occupied by Mr. B. Womersley, the Chairman of the Sanitary Committee of the Corporation, who, in proposing "The Sanitary Institute and Congress," remarked that the Institute had exercised a very great influence upon the health of the country, especially by directing public attention to the social conditions of the great towns. It had undoubtedly rendered pre-eminent service to the various municipal authorities by the diffusion of matters pertaining to the sanitary world; and one great result of the work of the Institute was that it had created a growing public opinion in favour of sanitation. Another pleasing feature was that it had constituted itself a licensing authority. The authorities of the Yorkshire College had paid considerable attention to sanitary matters in regard both to training and examination, and had set apart a professor for the purpose. The Sanitary Institute had already sent forth a noble army of more than 2500 sanitary inspectors; and he was pleased to think that the diplomas issued by the Institute to the successful candidates upon examination were honourably accepted by all the municipal authorities of this country. He coupled with the toast the name of Sir Douglas Galton, whose lifelong service to the sanitary world would, he said, commend him to the company. Sir Douglas Galton, in responding, said he had been associated for 25 years with the Institute, which was the child of the Public Health Act of 1875. It was formed for the purpose of advancing knowledge in sanitation all over the country; and this desire had been the mainspring of its action during the whole of its career. In 1877, the Council commenced examinations of sanitary inspectors; and they had granted certificates of competency to about 2500 persons. In many of these examinations they soon found that very much knowledge and experience which it was needful that these gentlemen who offered themselves for examination should acquire was not accessible to them. They therefore commenced a series of preliminary lectures; and by means of these he thought they had materially advanced sanitary science. In order to facilitate this, they united with the Parkes Museum, which was formed at the same time as the Institute, though on other lines. It was founded as a memorial to Dr. Parkes, who was a great sanitarian, and who had a most worthy successor in a member of the Committee of the Institute—Dr. Notter. The information diffused by the Institute by means of its library and lectures afforded a most complete hygienic education; and he was glad to hear that the Victoria University and the Yorkshire College had initiated a hygienic education, which he trusted would materially assist the Institute and the progress of sanitary science. There was no science which had so largely developed in the Victorian era as this; and recent progress was even greater than that of the earlier years of the Queen's reign. They recalled the names of Simon, of Chadwick, and of Rawlinson, who were pioneers of sanitation in this country. Chadwick was in his grave; but he had left a very worthy memorial of his life in a large bequest for the advancement of the science. Rawlinson and Simon, he was happy to say, were still alive; but he was afraid they would not again see them at their meetings. Sanitary science rested upon the principles inculcated by Moses and Hippocrates—purity of air, purity of soil, and purity of water; and he trusted they would all unite in their efforts to give effect to them. The President proposed "The City and Industries of Leeds," to which Sir J. Barran, Bart., responded, and the proceedings closed.

Later in the day, the President delivered his Inaugural Address in the Chemistry Class-Room of the College. Dealing with the progress of hygiene, he said: "Some cautious people are beginning to fear lest we may be going ahead too fast, and that, some day, when we find ourselves in advance of public opinion, it may be necessary to call a halt. But, taking it all over, our modern developments of sanitary organization have worked well, and have given general satisfaction. But some will probably ask: 'It is all very fine talking about fashion and popularity and progress, can you show any tangible results? Is the human race any longer lived, or better, or happier than in the good old days of pre-hygiene?' If you have any leaning towards the life-conditions of mediæval or post-mediæval England, read Simon's 'English Sanitary Institutions,' and the 'Health of Nations,' and I guarantee that you will thank your stars that your lines have been cast in the cleaner and pleasanter places of the Victorian era. There is no doubt that the average sum of life has been sensibly prolonged. But I claim for hygiene more than the prolongation of life—the betterment of it, the heightening of the mere joy of living, the clear and bright outlook over the horizon which results from good health. . . . Under the skilful guidance of Sir John Simon, Sir George Buchanan, and Sir Richard Thorne Thorne, some of the most acute minds in England have been unravelling abstruse sanitary problems, and tracking out from clues invisible to the ordinary eye, sanitary defects which were poisoning districts, and embittering and destroying human life." The President concluded his address by advocating the creation of a Ministry of Health—a State Department which would "collect and co-ordinate into one harmonious whole the scattered threads of sanitary legislation which entangle and frequently perplex every one of our great parliamentary offices; which would focus all health questions, and furnish a bureau of information; which would enable one to see at a glance what is going on elsewhere." He expressed the hope that the congress might not be inferior to any of its predecessors, and that much practical benefit might follow their deliberations.

In the evening, the Lord Mayor opened the Health Exhibition held in connection with the congress. In asking his Lordship to perform this ceremony, Professor J. Lane Notter, who had the supervision of the department, stated that this was their sixteenth exhibition. It was one of the largest, and he hoped would be one of the most successful, which had been held under the auspices of the Institute. These exhibitions had a twofold effect. They not only helped them to diffuse a knowledge of sanitary science throughout the country, but they had the effect of showing faults where faults were to be found, and of instituting a better and newer system of sanitary appliances, and thus safeguarding the health of the people. The progress which had attended these exhibitions had been remarkable. When the first was held in 1880, not more than 3400 persons visited it; but to the last nearly 52,000 people were admitted. The Lord Mayor, in declaring the exhibition open, expressed his gratification in noticing that Leeds inventors and Leeds members showed so well, and had done so much to promote sanitary science. If it were appropriate, which he was told it was not, he should have liked to make a review of the century and take the audience back to Leeds at the beginning of his life. At the time he was born, there were only 12,000 people who were receiving a supply of water from a public source from the Water Company; and there were 60,000 people in the town who were depending for their supply of water upon wells, which in a great majority of cases soon became sources liable to be continually contaminated. Therefore they could understand why the death-rate had diminished so remarkably since that period; and they could understand why the City authorities were justified in spending any amount of money in reason in procuring an abundant supply of water. With regard to the exhibits, he should like to mention that they in Leeds had done something in sanitary matters to bring about the improved health and the greater comfort and happiness now witnessed. They knew that the drain-pipe was made in Leeds very nearly as early as in any other district in this country; and he was happy to think that his father-in-law, the late Mr. Joseph Cliff, was an inventor in this direction. He experimented for many years and had many disappointments; but he ultimately succeeded, by mechanical means, in making those excellent drain-pipes which had done so much for the sanitation of the city.

On the following day, a conference on "River Pollution" was held in the Crown Court of the Town Hall, under the presidency of Major Lamorock Flower, the Sanitary Engineer to the Lea Conservancy Board. In his opening address, he stated that the watershed line was the proper boundary of conservancy districts. This idea, he said, was slowly but surely developing. It might be taken as a fact that there was not a single pollution for which there was not a remedy which, in many cases, would benefit the manufacturers. If not already shown, chemical science was sure to find out some means of purifying or cleaning effluents from factories, which would be effective and remunerative. If manufacturers ceased to discharge refuse into the sewers, the treatment of sewage at the outfall would be rendered more easy. Much might be done by individual action. In river pollution, no half measures should be adopted. What the country required was an Act of Parliament having compulsory, and not permissive, powers, entrusted to really competent men to carry out, administered in each watershed by a man who by his personal influence could induce polluters to abate their nuisances—not necessarily an autocrat, but one who knew how to exercise with judgment and firmness the duty confided to him, governed by Conservancy Boards to legalize the

acts of such officials. No sewage pollution should ever enter a stream, particularly one from which drinking water was drawn. But unfortunately the water-carried sewage of towns, in some cases protected by special clauses in Acts of Parliament, still either entirely or imperfectly purified, or escaping by the old enemy, the so-called storm-water overflows, passed into streams, wasting that which should produce food by manuring the soil—an operation which was now largely performed by fertilizers imported from abroad. In considering the question of the purification of rivers, the subject should be divided into two classes—first, the streams from which water supply was drawn, or, at all events, those portions of the watercourses which were above the intakes of any water supply; and, secondly, those from which no drinking water was drawn, or the parts which were below such intakes. His experience was that it was a wise policy to omit the question of standards of purity from Acts of Parliament in respect of river pollution. Discharges of effluent sewage, or effluents from factories, must be governed as to their condition by the volume and velocity of the streams into which such effluents passed; and it would be a difficult matter—indeed, it would be almost an impossibility—to devise a standard for general adoption. He favoured the freedom of action of the official in charge, who should be competent to decide on the matter. There was an enormous amount of waste in the discharge of trade refuse into streams. Looking at the question from all points of view, and well-nigh in despair of obtaining such an enactment as would coincide with the views of all persons interested, why not combine in a guild and endeavour to bring co-operative principles to their aid? Let the members of this proposed league act upon the principles which had governed the Fisheries Preservation Association, with which, indeed, it might be incorporated advantageously. The individual subscription for membership might be small, but the aggregate amount should be large. Such an association was quite possible; and, if properly organized, it might meet with the success which had been remarkably exhibited in other societies with different objects.

A paper by Mr. R. E. Middleton, M.Inst.C.E., on "Rivers Pollution from an Engineer's Point of View," was read by Dr. Collingridge. The author stated that much might be done by persuasion in the direction of preventing pollutions; but it seemed desirable that the Rivers Pollution Act, 1876, should be strengthened, and that the necessity for the supply of pure water should be more strongly enforced than could be done under the Acts of 1875 and 1878. A supply of pure water should precede sewerage works, not come after them. The Mersey and Irwell Act, 1892, and the Thames Conservancy Act, 1894, had been prepared with the object, *inter alia*, of giving increased powers to the authorities interested indealing with pollutions; and there did not seem to be any reason why these powers should not be extended to the whole country.

Mr. W. Naylor, the Chief Inspector under the Ribble Joint Committee, discussed the question of "River Pollution Standards." He quoted the standards recommended by the Rivers Pollution Commissioners in their report of 1870, and said that, with some slight modifications, they could not reasonably be objected to at the present day. A great difficulty was that the Commissioners' system of analysis was not followed. Their method of organic carbon and nitrogen was now replaced by two others—the "oxygen absorbed" and the "albuminoid ammonia" methods. Chemists differed as to the exact way in which the albuminoid ammonia should be estimated; and until this difference was settled, little would be done in the direction of formulating a standard. Dr. Reid, the Medical Officer of the Staffordshire County Council, expressed the hope that no standard of purity of sewage effluents would be fixed. A satisfactory uniform standard could not, he said, be arrived at. In Midland districts situated on small streams, a higher standard must be insisted upon than would be necessary in the case of towns on the banks of large rivers. What was wanted was that authorities should do all that could reasonably be expected of them. If the circumstances of the district were favourable, in that there was a large stream, a less strenuous rule might be observed. In the case of towns on small streams, much more was to be expected. As regarded trade effluents, it might be possible to arrive at a standard in special cases. If this could be done, it would, no doubt, be of service. Dr. Hill (Birmingham) agreed with the opinion expressed by Dr. Reid. Mr. Frank Scudder said that in 1891 he advised the Mersey and Irwell Joint Committee not to use any definite standard, but to rely upon the best available means to enforce purification. He did not agree with Mr. Naylor that a fixed standard was the proper one to adopt. The estimation of the total carbon and nitrogen was of no value in judging the quality of effluents. One had to discriminate between organic matter which was harmful and that which was harmless. In his opinion, the permanganate test differentiated between matter which was good and that which was bad. In this respect it was of great value in the examination of effluents.

The municipal representatives at the congress met in the Council Chamber at the Town Hall, under the presidency of Mr. Womersley, whose opening address was devoted to the progress of Leeds. He said the town received its first Charter of Incorporation from Charles II., in 1661, and this continued in force until the Municipal Reform Act was passed. The first Leeds Improvement Act dated back to 1755; and power was given by it to remove any nuisances or annoyances. After all these years, he was bound to confess that they had still some nuisances left in the city. In 1837, two very important Acts were passed—one for better lighting, cleansing, and sewering; and the other for the better supply of water. Before 1837, the water supply of the town was most unsatisfactory; being derived from wells, the River Aire, and from rain-water storage. But in that year a Company obtained an Act of Parliament authorizing the supply of water from the Wharfe. In 1852, the water-works were transferred to the Corporation; and in 1865, the present scheme was begun, by which the city was supplied with soft water gathered in the valley of the Washburn. Now the available daily supply of water was 28 million gallons—the average daily consumption being upwards of 14 millions; while more than 73 million gallons were supplied to neighbouring towns during last year. The disposal of sewage had always presented a most serious problem. The system which had been adopted was that of lime precipitation with large settling tanks. At the present works they were treating 16 million gallons of sewage at a yearly cost of £7000; and the purity of the effluent was much greater than that of the River Aire before it entered the city. In comparison with former days, the people were well protected from health dangers; and the Health Department was daily waging war with dirt, disease, and death with good results. Some people considered the death-rate of a city a fair criterion of its health conditions. The average mortality per 1000 in Leeds during the ten years 1865 to 1874 was 28·4; from 1875 to 1884, it was 23·7; from 1885 to 1894, it was 21·1; and in the three years 1894-5-6, 19·1. This prolongation and saving of life from 1885 to 1894, as compared with 1865 to 1874, represented a yearly saving of more than 2800 lives as the result of improved health-conditions. Surely no money value could be put on the saving of life and increase of human happiness these figures disclosed.

Dr. Godfrey Carter, in a paper on "Rural Sanitary Administration," spoke in detail of the insanitary condition of country districts, and gave instances of villages where the sewage passed straight on to the land, and where no powers were adopted by the health authorities to empty cesspools, clear ashpits, or afford a proper supply of pure drinking water. He suggested the active advocacy of the following recommendations: (1) That a Minister of Public Health should be appointed; (2) that every Medical Officer of Health should possess a special diploma in addition to his medical degrees, and should not be engaged in private practice; (3) that the present small and numerous rural sanitary districts should be linked into larger areas on the basis of the parliamentary electoral districts; (4) that the optional clauses in the Public Health Acts should be abolished; (5) that it should be illegal for any house to be let to a fresh tenant until the owner had received a certificate as to its fitness for occupation.

(To be continued.)

COLONIAL GAS UNDERTAKINGS.

Since noticing, in the "JOURNAL" for the 14th inst., the reports of certain gas undertakings in the Colonies which had reached us up to that time, particulars in regard to two other Companies have come to hand.

The Rockhampton (Queensland) Gas Company is a combined gas and electric light undertaking; and, singularly enough, in the half year ending June 30 there was no increase in the revenue from the supply of either illuminant. The Directors state, however, that the gas consumption during the two months preceding the date of their report (July 30), compared with the corresponding periods of the previous two years, indicated substantial improvement, which it might be hoped would be maintained. The existing plant is capable of meeting a very much larger consumption of gas; and the Directors will, of course, endeavour to increase the number of consumers in both branches of the Company's operations. An Electric Light and Power Bill, dealing with the whole question of the conduct of electric lighting enterprises in Queensland, has been passed; and on the 1st of January next the Company will come under its operations. In pursuance of its provisions, the Directors are applying to the various local authorities in whose areas it is proposed to operate, for their sanction to the granting of an Order to the Company by the Governor-in-Council. During the past half year the plant and buildings were carefully maintained by the Secretary and General Manager (Mr. W. Spier). The gas operations resulted in a profit of £1718 5s. 8d. The electrical business produced a return of £189 3s. 11d., which was used in part payment of the interest upon the debentures (£300); leaving a difference of £110 16s. 1d., represented in the debit balance of the profit and loss account of this section. The net profit for the whole of the business was £1607 9s. 7d., which, in order to strengthen the Company's position, the Directors recommended should be appropriated in the following manner: £1000 to be placed to the credit of the reserve fund for the equalization of dividends, and £607 9s. 7d. to the credit of the reserve fund for the maintenance and improvement of the plant.

The South Australian Gas Company had a revenue of £77,451 from the sale of gas and residuals in the year ending June 30; and a sum of £500 received for interest made a total of £77,951 at the close of the financial year. As the expenditure amounted to £47,998, there was a profit balance of £29,963. This is rather less than the sum realized in the preceding year, though there was a considerable increase in the quantity of gas sold. This is attributable to reductions made in the prices charged for gas, to the increased cost of coal owing to the strikes which occurred in the early part of the year, and to extra expenditure in renewals and replacements. As it will be necessary shortly to lay out a large amount in alterations to mains, services, and buildings, the Directors have decided to carry £2000 to a replacement fund. In consequence of the increasing demand for gas in Adelaide and its suburbs, it is necessary to provide additional plant for carbonizing, purifying, and condensing. The Directors have approved plans and estimates for a new retort-house, purifiers, and workshops; and the latter have been built. Satisfactory arrangements have been made for the supply of coal, and for the disposal of some of the residual products for the ensuing three years. The amount of the profit and loss account at the close of the year was £44,192; and after payment of the dividend there was a balance of £14,192 to be carried forward. As has been already mentioned in the "JOURNAL," the Company have lost by death their Chairman (Sir H. Ayres), who was a Director for about 35 years. His successor is Mr. J. Acraman, whose name in conjunction with that of the Secretary (Mr. J. Evans) appears at the foot of the accounts.

The Cost of Promoting the South Hants Water-Works Purchase Bill.—The ratepayers of Southampton are naturally much interested in the question of the outlay involved in the promotion by the Corporation last session of the South Hants Water-Works Purchase Bill, which was thrown out by the House of Lords Committee. There has been much speculation over the matter; and a statement was published that the expense would not exceed £1200. But "on the best authority," a local paper now reports that the Bill has cost the town £2044 odd; the costs of engineers and witnesses alone amounting to £900, and counsel to £310. It is calculated that £2000 is equal to a rate of 1¼d. in the pound. This, however, is not to be laid in one period; but will, it is understood, be spread over five years. It is not considered likely that, unless more interest is taken in the measure in the outlying districts, the Bill will make its reappearance.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Several weeks since I gave some particulars regarding the Aberdeen Corporation gas supply, and promised to revert to the subject. I now take it up. Mr. Johnston, the Convener of the Gas Commissioners, in submitting the accounts to the Town Council, said it would be seen that the gas had brought in a revenue of £71,442—the largest on record. This was £5000 more than double the amount in 1872, when the Council took over the gas-works, nothwithstanding that the price per 1000 feet was one-third less. The receipts from this source were £1400 more than estimated. Coke produced a revenue of £4298; and tar and ammoniacal liquor, £4723. There was a falling off in the receipts for chemical products from last year of £600. This falling off was wholly beyond the control of the Gas Committee; the sums received being regulated monthly by a sliding scale, according to the market values of the materials produced from the ammoniacal liquor. Gas-stoves brought in a revenue of £359. The revenue amounted altogether to the large sum of £81,002. On the other side of the account, coal cost £36,394, or £1600 in excess of the estimates; there being a greater quantity of gas produced than estimated. Wages were less than the estimate by £278. Lime and other materials were about the same; and taxes were £800 less. The other items were much the same as formerly; the total expenditure being £67,801—leaving a balance to be carried to the net revenue account of £13,200. Annuities cost £4949; interest on mortgages, bank accounts, reserve fund, &c., £2902; amount carried to sinking fund for the redemption of mortgages, £3845; amount set aside for gas annuities, £1200; amount set aside to reserve and fire insurance fund, £300—leaving a balance of £2 17s. 4d. The year's accounts were commenced with a favourable balance of £3651; and it was estimated that, with the exception of £600, this favourable balance would be consumed. Instead of this it had been preserved, and slightly added to; the balance carried to next year's account being £3654. The improvement in the percentage of unaccounted-for gas effected during the previous year had not, unfortunately, been maintained; there being an increase in the past year of fully ¼ per cent. The present book value of the undertaking stood at £151,687; being over £2000 less than last year. This book value did not represent the actual value; and a new valuation was ordered by the Council some time since. It showed the value of the undertaking to be £270,177, or an excess of £118,500 over the book value. The estimate for the ensuing year had been prepared on the basis of selling 441 million cubic feet of gas. The coal had been purchased on very favourable terms. Taking into account that the Committee had to recommend to the Council a reduction in the price of gas to 3s. 2d. per 1000 cubic feet, it would be admitted that the undertaking had been managed in the interests of the gas consumer. The cost of the undertaking originally in 1871 was £114,933; and there had been expended since on buildings, apparatus, main and service pipes, utensils, meters, railway to works, and gas-stoves, the sum of £182,720—making a total of £297,654 expended altogether. There had been paid off in depreciation £66,585; annuity contingent fund, £40,250; and on sinking fund on mortgage loans, £39,131—making a total of £145,966, and leaving the balance at £151,687. On the basis of the new valuation, and calculating 3 per cent. to be set aside every year, the undertaking would be redeemed within the next 33 years. The price of gas in 1872 was 5s. per 1000 cubic feet; and he had much pleasure in moving that the price be now reduced 2d. per 1000 cubic feet, making it 3s. 2d. This could be done, and still leave the favourable balance of £3654 before mentioned practically untouched.

In Greenock, the Corporation own the gas undertaking; and they are not ashamed to admit that they work it in such a way as to make a profit. On Tuesday of this week, the estimates for the current year in the Police Department were presented; and it was found that there was an anticipated deficit in the revenue. But what is the harm of having a deficit? A deficit but requires to be made up; and if you are not particular, you will make it up from the most convenient source, regardless of all other considerations. In Scotland, in the olden times, when a person in authority found himself unable to make ends meet, he frequently accomplished that purpose by making a raid upon his neighbour's goods. It is a general belief that this practice has died out in Scotland; but, I am sorry to say, it seems to linger on the Clyde littoral. If there is a deficit in any of the town finances, then make a gas surplus and appropriate it. It is true the methods of Rob Roy and his compeers cannot be followed. If they were tolerated, the parliamentary grant for the police might be lost, which would never do; and accordingly a more refined, but equally certain, method of plunder has to be resorted to. It was accomplished on this occasion by Provost Erskine moving that the estimated profits in the Gas Department be increased from £324 to £1000. He said that the Finance Committee had no desire to be forced to increase the rates by 1d.; and the estimates were so adjusted as to render this unnecessary. In these estimates, the expectation was held out that the Gas Trust should work out a surplus of £1000, in place of the £324 which they promised. This, in his opinion, was a simple estimate to expect from the Gas Trust, as when he was Convener of that Committee they paid the Board in 1890 £3456, in 1891 £2041, and in 1892 £1466. He was quite aware that some gentlemen had the idea that gas should be sold exactly at the cost of production. But he thought that the department should be managed in such a way as to produce a fair commercial profit; and in the estimate of £1000, he did not think they were putting an undue burden upon it. Treasurer Anderson seconded the motion of the Provost. He said that the fact of there being a deficit of over £1300, had taken many of them by surprise. However, when the details of the statement were examined, they found that it had arisen from two causes—the failure of the Gas Trust to provide the £1000 expected, and the increase of expenditure in the Cleansing Department. Bailie Watson moved, and Mr. Cameron seconded, that the deficiency be carried forward to next year, which was the proper way of financing. Bailie Mitchell moved that the £324 estimated profit from the Gas Trust, agreed to and passed by the Board on Aug. 17, be retained. Bailie Watson withdrew his motion in favour of Bailie Mitchell's, which he seconded. On a division, the Provost's motion was accepted by 11 votes to 9.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 673).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	9 Apl.	10½	Alliance & Dublin 10 p. c.	24½—25½	+½	4 2 4
100,000	10	,,	7½	Do. 7 p. c.	17—18	..	4 3 4
300,000	100	1 July	5	Australian (Sydney) 5% Deb.	106—108	..	4 12 8
200,000	10	27 May	7	Belgrano (B. Ayres), Limited	9½—10	..	7 0 0
100,000	Stck.	29 June	5	Do. 5 p. c. Deb. Stk	103—106	..	4 14 4
200,000	5	27 May	6½	Bombay, Limited	6¾—7¼	..	4 9 7
40,000	5	,,	6½	Do. New, £4 paid	5¼—5¾	..	4 10 7
380,000	Stck.	27 Aug.	12	Brentford Consolidated	297—302	..	3 19 5
240,000	,,	,,	9	Do. New	220—225	..	4 0 0
50,000	,,	,,	5	Do. 5 p. c. Pref.	145—150	..	3 6 8
159,375	,,	11 June	4	Do. 4 p. c. Deb. Stock.	135—139	..	2 17 6
220,000	Stck.	15 Sep.	11⅓	Brighton & Hove Original	270—275*	..	4 3 7
208,820	,,	,,	8½	Do. A Ord. Stk.	200—205*	..	4 2 11
933,500	Stck.	27 Aug.	5	Bristol, 5 p.c. max.	130—135	..	3 14 1
420,000	20	26 Mar.	11¼	British	56½—57½	+½	3 18 3
50,000	10	27 Aug.	11½	Bromley, Ordinary 10 p. c.	23—25	..	4 12 0
71,000	10	,,	8½	Do. 7 p. c.	18—20	..	4 5 0
500,000	10	28 Apl.	6	Buenos Ayres (New) Limited	10½—11½	..	5 4 4
93,122	Stck.	—	4	Do. 4 p. c. Deb. Stk.	98—100	..	4 0 0
150,000	20	15 July	8½	Cagliari, Limited	30—32	..	5 3 1
100,000	10	11 June	8	Cape Town & District, Ltd.	16½—17½	..	4 11 8
50,000	50	3 May	6	Do. 6 p. c. 1st Mort.	59—60	..	5 0 0
350,000	Stck.	9 Apl.	13½	Commercial Old Stock	343—348	..	3 17 6
165,000	,,	,,	10½	Do. New do.	257—262	..	4 0 1
165,000	,,	11 June	4½	Do. 4½ p. c. Deb. do.	155—158	..	2 16 11
800,000	Stck.	11 June	13	Continental Union, Limited.	255—260	..	5 0 0
200,000	,,	,,	10	Do. 7 p. c. Pref.	215—220	..	4 10 11
51,600	Stck.	27 Aug.	14	Croydon Com'cial A 10 p. c.	315—320	..	4 7 6
163,400	,,	,,	11	Do. B 7 p. c.	252—257	..	4 5 7
535,000	Stck.	12 Aug.	5¼	Crystal Palace Ord. 5 p. c. Stk	137—140	..	3 15 0
60,000	,,	,,	5	Do. 5 p. c. Pref.	140—143	..	3 9 11
486,090	10	29 July	11	European, Limited	25½—26½	+½	4 3 0
354,060	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 11
5,896,590	Stck.	12 Aug.	12¾	Gaslight & Coke, A, Ordinary	316—319	−1	3 19 11
100,000	,,	,,	4	Do. B, 4 p. c. max.	113—118	..	3 7 10
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	317—322	+2	3 2 2
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	150—155	..	3 4 6
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	220—225	..	3 6 8
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	203—208	..	3 7 4
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	315—320	..	3 2 6
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	180—185	..	3 4 10
1,061,150	,,	11 June	4	Do. 4 p. c. Deb. Stk.,	138—141	..	2 16 9
294,850	,,	,,	4½	Do. 4½ p. c. do.	156—159	+1	2 16 7
908,000	,,	,,	6	Do. 6 p. c. do.	207—212	..	2 16 7
70,000	10	13 May	8	Hongkong & China, Limited	14—15	..	5 6 8
3,800,000	Stck.	13 May	10	Imperial Continental	217—222	..	4 10 2
376,400	100	3 Aug.	4	Do. 4 p. c. Debs. Red.	99—102	..	3 18 5
473,600	Stck.	12 Aug.	3½	Do. 3½ p. c. Deb. Stk ,,	104—107	..	3 5 5
75,000	5	29 June	6	Malta & Mediterranean, Ltd.	5½—6	..	5 0 0
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	112—114	..	4 7 8
250,000	100	,,	4½	Do. 4½ p. c. Debs.	108—110	..	4 1 10
541,920	20	11 June	5	Monte Video, Limited	15—16	..	6 5 0
150,000	5	27 May	8	Oriental, Limited	8—8½	..	4 14 1
135,000	5	,,	8	Do. New, £4 10s. paid	7¼—7½	..	4 12 10
15,000	5	,,	8	Do. do. 1879, £1 paid	1¾—2	..	4 0 0
60,000	5	26 Mar.	7	Ottoman, Limited	4¾—5¼	..	6 13 4
420,000	100	3 May	6	People's Gas } 1st Mtg. Bds.	104—109	..	5 10 1
500,000	100	1 June	6	of Chicago } 2nd Do.	105—110	..	5 9 1
250,000	10	27 May	10	San Paulo, Limited	14¾—15¼	..	6 9 0
5,475,000	Stck.	12 Aug.	5¼	South Metrop., 4 p.c. Ord.	145—148	..	3 10 11
1,416,667	,,	15 July	3	Do. 3 p.c. Deb. Stk.	106—109	..	2 15 0
60,000	Stck.	15 Sep.	12	Tottenham & Edmonton, A	275—285*	..	4 4 2
60,000	,,	,,	9	Do. B	190—200*	..	4 5 0
182,380	10	27 May	10	Tuscan, Limited.	13¾—14¾	..	6 18 0
149,900	10	1 July	5	Do. 5 p. c. Debs. Red.	100—103	..	4 17 1
				WATER COMPANIES.			
746,159	Stck.	29 June	10½	Chelsea, Ordinary	337—342	+2	3 1 5
150,000	,,	,,	5	Do. 5 p. c. Pref.	177—180	..	2 15 6
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	157—160	..	2 16 3
175,785	,,	26 Mar.	4½	Do. 4½ p. c. Deb. Stock	160—165	..	2 14 6
1,720,560	Stck.	9 Apl.	7½†	East London, Ordinary	227—232	+2	3 4 8
554,740	,,	29 June	4½	Do. 4½ p. c. Deb. Stk.	163—166	..	2 14 3
390,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	106½—107½	..	2 15 10
700,000	50	11 June	7½	Grand Junction, 10 p.c. max.	120—125	..	3 0 0
295,000	Stck.	26 Mar.	4	Do. 4 p. c. Deb. Stk.	148—153	..	2 12 4
708,000	Stck.	12 Aug.	13	Kent	351—356	..	3 13 1
160,000	,,	,,	7	Do. New, 7 p. c. max.	215—220	..	3 3 7
1,043,800	100	29 June	9½	Lambeth, 10 p. c. max.	288—293	..	3 6 6
406,200	100	,,	7½	Do. 7½ p. c. max.	223—228	..	3 5 9
350,000	Stck.	26 Mar.	4	Do. 4 p. c. Deb. Stk.	147—150	..	2 13 4
500,000	100	12 Aug.	13	New River, New Shares.	447—452	+3	2 17 6
1,000,000	Stck.	29 July	4	Do. 4 p. c. Deb. Stk.	151—154	..	2 11 11
902,300	Stck.	29 June	5	S'thwk & V'xhall, Ordinary	160—163	..	3 1 3
126,500	100	,,	5	Do. Do. 7½ p. c. Max.	151—154	..	3 4 11
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	173—178	..	2 16 2
1,019,585	,,	9 Apl.	4	Do. 4 p. c. A Deb. Stk.	145—148	..	2 14 2
1,155,066	Stck.	11 June	10	West Middlesex	315—320	+2	3 2 6
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	163—166	..	2 14 3

† Next dividend will be at this rate. *Ex div.

What looks like either another premature disclosure of a document which has been submitted to the Edinburgh and Leith Gas Commissioners, or an attempt to make a newspaper look foolish by the publication of old news, occurred on Thursday, when the "Edinburgh Evening Dispatch" gave prominence to a report by Mr. George Lisle, C.A., upon the scheme of superannuation for officials and employees, which is proposed by the Commissioners. Mr. Lisle has, of course, been consulted, as an actuary, upon the feasibility of the scheme; but the whole matter was disclosed at the meeting of the Commissioners on July 26 last, and was then given in various publications. There is this news, however, in Mr. Lisle's report, that there are at present 569 workmen in permanent employment in the Edinburgh works who would be eligible, and 228 in the Leith works. The officials number about 81; making a total of 878 available members. The wages paid to those who may be classified as permanent may be taken at £50,000 per year. To this, however, has to be added the wages and salaries paid in the Surveyor's Department, and salaries for the staff, &c., which amount to £10,651; making a total of £60,651 a year to employees who might be included in the scheme. Three per cent. on this sum is £1819, which would represent the amount to be set aside by the Commissioners, and also the sum payable by the employees. Taking the amount payable by the men, the sum set apart by the Commissioners, and a special contribution of £1000 a year for five years, the fund would then amount to £24,625. The matter, as I stated before, is to be submitted to the Town Council and the Water Trust, with a view to getting them to join in a comprehensive scheme for all public employees.

The Forfar Gas Corporation have strange ways of transacting business. This week they resolved to advertise an old boiler for sale; and on the motion being made, Mr. Christie wanted to know if it was right that they should ask another Corporation to accept what they could not use themselves. All the same, the Corporation agreed to try if some other Corporation would take it. Then a long discussion took place over the allegation that on a recent occasion a leak of gas occurred in one of the streets, and that three messengers were sent to the gas-works for a man to attend to it, before anyone was sent; the period of delay being six hours. What added point to the discussion, and seemingly was the reason why so much was made of the matter, was that the Manager was from home at the time. He was, he explained, away looking after new retorts; but he left three men who were competent to do all the work which was required. This was not considered a sufficient explanation; and a remit was made to a Committee, on the motion of an enlightened ex-Provost, "to arrange about this, as to the who, and why, and wherefore, of the matter"—whatever that may mean. While the Corporation do their best, by incessant wranglings and displays of jealousy to ruin their gas business, it is satisfactory to see that it continues to flourish.

The Directors of the Galston (Ayrshire) Gas Company have shown their appreciation of the services of Mr. Muir, their Manager, by advancing his salary by £10 a year. Mr. Muir has been Manager at Galston for five years; and during this time he has brought the Company's business up to a high state of efficiency.

Since I mentioned, a fortnight ago, the results of the year's working of the St. Andrews Gas Company, I have learned that the Directors, besides formally thanking the Managers (Messrs. J. & R. Hall) for their services, voted them a sum of £50.

Mr. A. M. Moir, the Chief Inspector of Weights and Measures to the Corporation of Aberdeen, in an annual report, says that the number of gas-meters tested during the year was 1037; and the fees amounted to £30. Of these, 982 were tested for the Corporation gas-works; the remaining 55 being tested for outside complainers. Of those tested for the Corporation, 88, or 8·9 per cent., were found to be not in accordance with the Sale of Gas Act. Of the 55 tested for consumers, 38 were found correct; the remaining 17, or 30·9 per cent., not being in conformity with the Act.

The Police Commissioners of Largs have this week resolved, by four votes to two, to adopt the Burghs Gas Supply Act, with a view to the acquisition of the local gas undertaking.

The Corporation of Stirling had before them this week the last of their accounts in connection with the abortive gas transfer. These amounted to £76 for agents' outlays, £484 expenses of the reference before Sheriff Lees, and £275 parliamentary expenses—a total of £836. These were almost entirely the expenses of the Gas Company. A Committee who had examined the accounts recommended payment of all except three items amounting to £196, liability for which, they considered, in terms of a letter by the Secretary to the Gas Company, falls to be determined by Sheriff Lees. The Council agreed to pay the accounts, as recommended; one member dissenting. The Corporation have had to pay heavily for their attempt to take over the gas undertaking. In justice to them, however, it ought to be recalled that the failure of the negotiations was not due to the members of the Corporation, but to an alarmist opposition. The total cost to the community will, I presume, not be under £1500. Instead of taking over the gas and having a yearly profit out of it, which was a certainty, they have squandered £1500 in proceedings which bring no benefit to the town, and not only leaves the profit-making in the hands of the Gas Company, but fixes them more firmly than ever in their seat. Should the Company go to Parliament for statutory powers, the Corporation cannot very well oppose them, unless they come forward with a proposal to take over the Company. As this does not seem likely, the probability is that the municipalization of the Stirling gas undertaking is a long way off; and that, in the matter of not having the lighting in the hands of the Corporation, Stirling will very soon be an exception among the burghs of any note in Scotland.

Some time ago it was mentioned that the Glasgow Gas Trust had resolved on the erection of a new gasholder, and within the past few days the Corporation Gas Committee have accepted a tender for the construction of the tank. It is reported that only four or five tenders were received, and that of Messrs. John Paterson and Son, Limited, is the one accepted, it being the lowest—£20,810. The holder is to be erected at the Temple Gas-Works, Maryhill, near the site of the large holder brought into use some few years since, one of some 6 million cubic feet; and the tank which is to contain it is to be of the same diameter as the one Messrs. Paterson and Son recently constructed at the Tradeston works—220 feet—but instead of being 40 feet in depth, like the one

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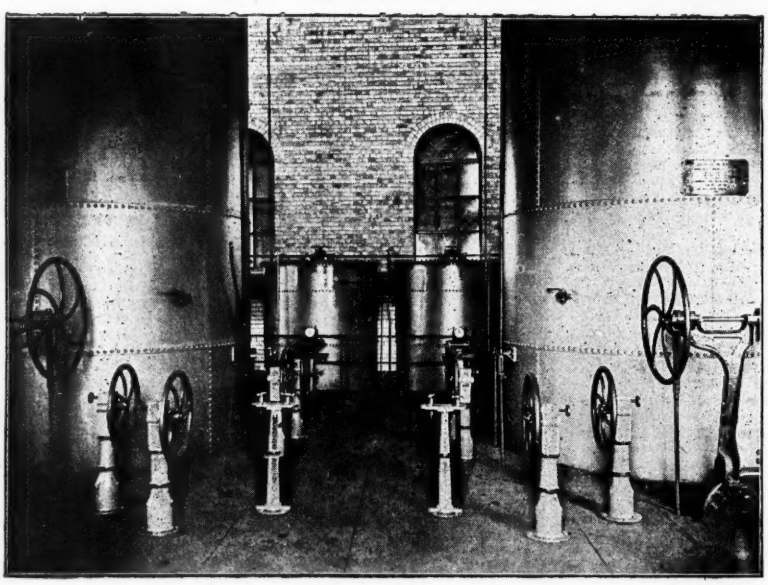

RESULTS PROVE EFFICIENCY.

Working Floor of Generator House. One Quarter Section of Birmingham Plant, Windsor Street Station.

at Tradeston, it is to be 45 feet. The site of the new tank was part of a sandstone quarry, some twenty years ago; and, roughly speaking, the quarry was worked to a depth of about 45 feet. But the site still includes a lot of rock which has to be removed. The lining of the tank has to be formed of pressed brick; but though the Contractors for the tank are also brickmakers, they will have to purchase the pressed brick required for the special job. In the terms of the contract it is said to be stipulated that the work must be completed by the 31st of March next—just six months; and including the worst portion of the year. If this be so, there will be ample need for the employment of labour-saving machinery on a large scale. The tenders for the construction of the holder have not yet been asked for; but it may be concluded that a strenuous effort will be made to retain the contract in Scotland. As the holder is to be a three-lift one, like that at the Temple works, it may be anticipated that when filled with gas it will rise to a height of about 135 feet.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 25.

Sulphate of Ammonia.—There has again been an active market, and further improvement in values; the closing quotations being £8 2s. 6d. to £8 5s. per ton, delivered f.o.b. at the ports. Supplies for prompt delivery have been rather more plentiful; but they have met with a ready sale at the advance. A good business has also been done for October; the greatest activity being in Scotland, where up to £8 6s. 3d. per ton has been paid. In the forward position, transactions are reported at £8 per ton, Beckton terms, October-December delivery. At other ports, £8 6s. 3d. per ton, ordinary terms, has been accepted, October-March delivery; and more money is now required.

Nitrate of Soda is quiet on spot, at 7s. 6d. per cwt. for fine quality. Afloat and for shipment, there is not much doing; and quotations are barely maintained.

LONDON, *Sept.* 25.

Tar Products.—Benzols are firmer; but buyers will not pay the higher figures of makers, although business has been done at an advance on last week's prices. The sudden improvement in benzols rather points to sellers being oversold, and deliveries being behind as the month nears its end. Pitch is weak; but the consensus of opinion is that it will not further recede. There is a good inquiry for solvent and ordinary naphthas; while a distinct improvement is noted in respect to naphthalene. Carbolic acid is dearer and scarce; while creosote oils are in excellent request, and stocks in makers' hands very low. There is no news in respect to anthracene, which is nominally quoted at the old rates. Market quotations are: Tar, 17s. to 21s. Pitch, west coast, 17s.; east coast, 19s. to 20s. 6d. Benzol, 90's, 1s. 10½d.; 50's, 2s. Toluol, 2s. 3d. Solvent naphtha, 1s. 7d. Crude, 30 per cent., naphtha, 11d. Creosote, 1¾d.; liquid, 2¼d. Heavy oils, 35s. Carbolic acid, 60's, 1s. 10d. Naphthalene, pressed, 50s.; salts, 22s. 6d. Anthracene, "A" quality, 6d.; "B," 4d. to 5d.

Sulphate of Ammonia is selling freely, both for prompt and forward delivery, at the following rates: Beckton, £8; London, £8 2s. 6d.; Liverpool, £8 3s. 9d. to £8 5s.; Hull, £8 2s. 6d.; Leith, £8 5s.—all less 3½ per cent. A distinct tendency to harden marks the market. There is a scarcity of stuff, although the make is now enlarging.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—With the close of the month, there is a general hardening tendency in the better qualities of round coal; and though it is exceptional where there is any actual advance, the low quotations made during the summer months are in some cases being stiffened up to the full list rates. The orders coming forward are enabling pits in most cases, with very little accumulation of stock, to work pretty nearly full time; and generally the outlook for the ensuing season is regarded as satisfactory. Best Wigan Arley is now being quoted from 10s. to 10s. 6d. per ton at the pit mouth; Pemberton four-feet and seconds Arley, 8s. 6d. to 9s.; and the lower qualities of round coal, 7s. to 7s. 6d. The generally unsettled industrial position throughout Lancashire is, of course, having its effect upon all descriptions of fuel for iron making, steam, and general manufacturing purposes. Common round coals are moving off only moderately; and though increasing inquiries for common house-fire coal are taking off the market a good deal of this class of fuel, there are still plentiful supplies, and prices are only being maintained. Ordinary steam and forge coal averages about 6s. per ton at the pit mouth. The depression in the cotton trade, and the probability of further stoppages of works, is affecting engine fuel; and with the increased quantity of slack coming upon the market, the outlook is anything but satisfactory. For the present, however, except that the tendency towards hardening in prices which was noticeable a week or so back has altogether disappeared, there is no really quotable change upon late rates. Common slack averages 3s. to 3s. 6d. per ton at the pit; medium, 3s. 9d. to 4s. 3d.; and best sorts, 4s. 6d. to 4s. 9d. In the shipping trade, there is still a fair business doing in steam coals; and these are fetching 7s. 6d. to 7s. 9d. per ton delivered at the Mersey ports or the Partington tips of the Manchester Ship Canal, and 8s. to 8s. 3d. per ton delivered on board at Manchester Docks.

Northern Coal Trade.—There is a slight falling off in the demand for steam coal, and the exports are less; but there is an increased consumption of both gas and household coal, which makes the Durham coalfield brisker than it was. In Northumberland, best steam coals are from 8s. 4½d. to 8s. 6d. per ton f.o.b.; second qualities, 8s.; and steam smalls, 3s. 6d. As the Baltic season is now nearing its close, the shipments of steam coals must soon decrease. Manufacturing coals are weaker; the strikes in the engineering and shipbuilding trades affecting the consumption. The gas coal trade feels the benefit of an enlarging use; there being a fuller demand both for local and distant gas companies. Most of the deliveries are on old contracts; but for occasional cargoes, the price varies from 7s. 6d. to 8s. 3d. per ton f.o.b.

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There is no change in the price of gas coke, and stocks seem to be well kept under at most of the local works.

Scotch Coal Trade.—The coal trade is in a sort of mixed state. The policy of the men in short working led to disorganization, because shipowners were chary of sending their vessels to load in Scotland, on account of the irregularity of the supplies. Already there are indications that the miners are not very favourable to the restriction; and the masters being firm in their refusal of the advance which has been asked of 10 per cent., there is a probability of the effects of the movement among the men passing away soon. So far as it has gone, the decline of shipping has kept the markets at home better filled, and thus prevented prices from rising, as they would otherwise have done. The rates are: Main, 7s. per ton f.o.b. Glasgow; ell, 7s. 6d. to 7s. 9d.; splint, 7s. 6d. to 7s. 9d. The shipments for the week amounted to 171,380 tons—a decrease of 14,915 tons upon the preceding week, but an increase of 1459 tons upon the corresponding week of last year. For the year to date, the total shipments have amounted to 5,738,280 tons—an increase upon the corresponding period of last year of 218,954 tons.

Steyning and District Water Supply.—The shares of the Steyning and District Water Company have all been taken up at par; and the works will be commenced immediately.

Important Water-Works Projects at Keighley.—The Water Committee of the Keighley Town Council are proposing to purchase the Highfield and Keighley Moor reservoirs, which are the property of the Duke of Devonshire. They also recommend the Council to ask Parliament to extend the time for the completion of the low-level water scheme and of the conduit between Sladen Valley and Lees; and to authorize such modifications of the scheme as may be deemed advisable before the time for the deposit of the parliamentary plans.

Outbreak of Typhoid Fever at Maidstone.—The town of Maidstone and the adjoining parishes of Barming and Farleigh have been visited by a serious outbreak of typhoid fever—nearly 800 cases having been recorded during the past fortnight. At a recent meeting of the District Council, the Deputy Medical Officer of Health (Mr. P. Adams) expressed the opinion that the trouble had been caused by the Farleigh Springs of the Water Company, which supply about half the town, being polluted by drainage from a fruit and hop pickers' encampment. As soon as the source of the pollution was discovered, the Farleigh supply was cut off by the Company. It would seem that the Medical Officer was right, inasmuch as the disease has made its appearance in many houses on one side of a street which is supplied with the Farleigh water, while those on the opposite side, whose supply is derived from the Boarley Springs, have entirely escaped. Asked if the source of the Farleigh supply was open to pollution by people, he replied the Water Company had taken precautionary measures to endeavour to prevent this. Last Thursday, samples of the water were taken for analysis, with the result that it has been declared polluted. Serious as is the position of affairs, the number of fresh cases is decreasing.

Explosion of Gasoline at Bainbridge (Ohio).—According to a Central News telegram, an explosion of gasoline occurred last Thursday in a drug store at Bainbridge (Ohio). The store was set on fire, and several adjoining buildings were attacked by the flames. When the last dispatch was sent from the scene, the whole town was burning; and it was reported that eight lives had been lost.

The Para (New) Gas Company, Limited, is the title of a Company formed with a capital of £80,000, in £10 shares, to acquire the undertaking of the Pará Gas Company, Limited, now in operation at Balem, in the province of Pará, Brazil; and with a view to this object to adopt and carry into effect an agreement made between the Colonial Lighting Syndicate and the Company. Among the signatories are Mr. J. Hepworth, Mr. J. Dempster, and Mr. R. Dempster. The first Directors are the two former gentlemen and Messrs. W. H. Cowan and W. S. Haldane.

Tendring Hundred Water-Works Company.—The annual report of the Directors of this Company states that the revenue from all sources for the past year has been £4093, as against £3686 for the previous year—an increase of £407; while the total expenditure chargeable to revenue account amounted to £1669—being £189 less. The gross profit for the year was £2424; being an increase of £596. There remains a balance of £1407 available for dividend (after carrying £100 to the depreciation fund account). A dividend of 3 per cent. is to be paid on the "A" shares, which, with the interim dividend, will make 4½ per cent. for the year. A payment of 1 per cent. is also to be made on the "B" shares.

Penny-in-the-Slot Gas-Stoves for Leeds.—The Gas Committee of the Leeds Corporation have decided to introduce gas cooking-stoves on the automatic prepayment system. This resolution was come to at a meeting of the Committee last Tuesday, on the recommendation of the Workshops Sub-Committee; and we learn that steps will be taken to place the stoves within the reach of householders as soon as possible. They will be supplied, together with a meter, on the basis of a charge of 2s. 9d. per 1000 cubic feet of gas consumed, which will include the hire of the appliance. The new system will, it is confidently expected, benefit the Gas Department by considerably increasing the consumption of gas in the summer months, when it is only about 33 per cent. of the winter output.

Gas Explosion in a Sewer at Guildford.—An explosion of gas took place in the sewer in Onslow Road, Stoke, Guildford, on Monday evening last week. Complaint of a smell of gas having been made, the Sanitary Inspector visited Onslow Road, and found a strong odour of gas at the air-inlet of the sewer. The man employed to flush the drains said he thought the smell was from sewer gas; and he struck a match, whereupon there was a loud explosion, and a large body of flame shot up into the air. Explosions occurred at other parts of the road; but fortunately no one was injured. On an examination being made on Tuesday morning, it was found that the gas-main had been built into the brickwork of a lamp-hole and the manhole of the sewer running up Onslow Road. A fracture had been caused in the main, and the gas consequently escaped into the sewer.

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Keighley Corporation Gas Profits.—The Gas Committee of the Keighley Town Council report that the profits for the year ended June 30 (after lighting the public lamps free of charge) amounted to £12,112. After providing for loans and sinking funds, paying the cost of the fire brigade, £592, and the cost of the specifications of patents library, £45, the surplus is £6170, which the Committee recommend shall be appropriated as under: In aid of the rates, £2400; reduction of capital, £3085; reserve fund, £685.

The West Cowes Gas-Works Arbitration.—The wish of the West Cowes District Council to have the arbitration connected with the purchase of the local gas-works conducted locally will not be gratified, as inquiries have convinced them that such a course would add to the expense. The proceedings will therefore take place in London, and will commence on the 25th prox. Mr. Corbet Woodall has been retained to look after the interests of the Gas Company, and Mr. E. H. Stevenson will represent the Council.

Extension of the Selby Gas-Works.—The Selby Urban District Council have decided to apply for a Provisional Order to allow of further extension of their gas-works; and the following plant is to be fixed early next year: A 100 ft. by 25 ft. gasholder and tank, four new purifiers, a purifier-house 120 ft. by 60 ft. span, a new station-meter and meter-house, and sulphate of ammonia plant. These additions will necessitate the taking in of an adjoining site. A sum of £7000 has been voted for the additions. Selby is opening out as a manufacturing centre; ship-yards, works, and mills being built. The place is growing rapidly; and the present gas-making plant, though much enlarged two years and a half ago, is too small to cope with the rapid increase.

Reductions in Price.—The Leamington Gas Company have reduced their price 1d. per 1000 cubic feet within the borough boundary, and 2d. in the outlying district. At the last meeting of the Bingley District Council, it was decided, on the recommendation of the Gas Committee, to reduce the price of gas for all purposes 2d. per 1000 cubic feet from July 1; the price in future to be 2s. 6d. per 1000 cubic feet within, and 2s. 8d. beyond the district of the Council; the discounts to remain as before. The Police Commissioners of Gourock have reduced the price of gas from 3s. 7d. to 3s. 6d. per 1000 cubic feet to consumers within the burgh, and from 5s. 5d. to 5s. 4d. to those outside. The Bervie Gaslight Company have lowered their price from 8s. 9d. to 8s. 4d. per 1000 cubic feet.

Additional Capital for the Taunton Gas Company.—By the Act obtained last session, the Taunton Gas Company were empowered to raise additional capital by the creation of new ordinary and debenture stock; and at a special meeting of the Company held on the 17th inst., the shareholders unanimously passed two resolutions sanctioning the issue of the debentures, and the raising of £10,000 (inclusive of premium) of the £40,000 of ordinary stock. The Chairman (Mr. J. Barrett) explained that, though it was stated that a sum not exceeding £10,000 would be expended on the works during the first year, the Directors really did not think the outlay would exceed £6000 or £7000. The new plant that was being put down would enable them to manufacture gas of much greater illuminating power than that now produced, and moreover at a much cheaper rate. The confidence of the shareholders in the Directors was shown by the fact that proxies to the extent of 90 per cent. had been received in support of the resolutions.

Bread Baking by Gas.—The recent advance in the price of bread has led certain ladies of Peckham to curtail their household expenses by making themselves the important article of food for the supply of which they have hitherto depended upon the baker. One communicative housewife gave some particulars on this matter to a representative of the "Daily Mail," and according to these she saves at least 2d. per quartern loaf. The sample of bread she showed her visitor was light, white, and appetizing; and in regard to it she said: "I make it of the best flour, and use dry yeast; and the baking is done in a gas-stove oven, which holds four quartern loaves." Some instructive details were gathered by the reporter at the South Metropolitan Gas-Works, where it was learned, on the authority of figures prepared for the purpose, that one pennyworth of gas supplied through the Company's slot meters was sufficient to bake three 4lb. loaves, and that the ovens were peculiarly suitable for baking purposes, inasmuch as an even degree of heat could always be maintained.

Torquay Gas Company.—Mr. J. Kitson, J.P., presided at the half-yearly meeting of the Torquay Gas Company last Thursday; and, in moving the adoption of the report, said the receipts for the half year were set down at £12,470, and the expenditure at £9152—showing an estimated profit of £3318. The usual dividend at the rate of 10 per cent. would absorb £3396; so that there would be a small deficiency. As to the immediate future, they might anticipate an increase in the price of coal and the cost of freight. They had 300 prepayment meters in use for lighting, and 100 for cooking. There had been an increase of 2,325,000 cubic feet in the quantity of gas sold. He went on to refer to the recent litigation respecting the assessment of the works, the result of which was that the net rateable value was reduced to £1750 from £2400, the original amount, and £2800, to which the Overseer raised it. The saving to the Company by the reduction was about £200 a year. The moral was that it was desirable to leave well alone, and that public officials should be careful about taking advantage of any little authority their position gave them. The accounts were adopted, and the usual dividends declared.

Water Scheme for Carmarthen.—A meeting of the ratepayers of Carmarthen was held last Tuesday, for the purpose of hearing a statement with reference to the construction of new water-works. The Town Clerk explained that the Council were compelled to go in for a new water scheme, as the present one had been condemned by the Local Government Board; and they could not obtain powers to borrow money for the renewal of the corroded mains. It was estimated that the contemplated scheme would cost £18,000, of which £6000 would be absorbed in compensation, legal, and preliminary expenses. If an Act was obtained, £16,000 could be borrowed, repayable in fifty years; the remainder, for incidental expenses, being repayable in ten years. This would mean an annual outlay of £870 for the first ten years, and £650 for the remaining forty years. Against this they would save the £350 now spent annually in connection with the present pumping-station; so that the net annual increase of expenditure would be only £520 for the first ten, and £300 for the remaining forty years. If the water-rate were increased to about 13d., the ratepayers would have an ample supply of pure water. The new scheme would provide for a storage of 15 million gallons, and a daily supply of 24 gallons per head to 10,000 inhabitants. It was unanimously decided to support the proposals of the Council.

The Water-Works Purchase Question at Portsmouth.—The question of the purchase of the Portsmouth Water-Works by the Town Council has reached an acute stage, after the receipt of opinions from three eminent Counsel on the point as to whether the Company are legally authorized to base their rents on the rateable or on the gross rental value of the properties supplied. It will be remembered that the Counsel consulted on this matter were Sir E. Clarke, Q.C., Mr. Asquith, Q.C., and Mr. Cripps, Q.C.; two being in favour of the principle of rateable, and one of gross value. The Corporation think that, under these circumstances, a favourable opportunity presents itself for making a lower offer for purchase; and it was with this view that a discussion was again set on foot at a meeting of the Town Council last Tuesday. Mr. Kimber proposed that it should be an instruction to the Water Committee to interview the Directors of the Water Company, to ascertain if they were prepared to reduce the charges now made for the supply of water from the gross rental to the rateable value, and also to reconsider the terms of purchase. Alderman Ellis seconded the proposition, and advocated taking a test-case to the Courts. Other speakers approved of this course, as the purchase would involve a million of money; and the motion was carried unanimously.

The Glenboig Fire Clay Company, Limited, made a profit during the past year of £19,325, which the Directors have resolved to dispose of as follows: Depreciation, £5000; dividend at the rate of 10 per cent. per annum, £13,500; to be carried forward, £825.

Reference is made in another column to the Health Exhibition held in connection with the Congress of the Sanitary Institute at Leeds. In the list of awards in connection with the exhibition, we notice that the Davis Gas-Stove Company, Limited, have obtained a silver medal for their "Metropolitan" gas-cooker; the Leeds Fire-Clay Company, Limited, silver and bronze medals; and the Cannon Hollow-Ware Company and Messrs. John Russell and Co., Limited, bronze medals—the former for their enamelled cast-iron and their "Hercules" gas-cooker; the latter, for their wrought-iron and steel tubes and their cup fittings for incandescent gas-lamps. Messrs. E. Walker and Co. have been awarded a bronze medal for their tin-lined iron water-piping.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

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ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

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JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER LINCOLN."

[For Illustrated Advertisement, see Sept. 7, p. 553.]

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JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.

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PATENT GAS EXHAUSTERS AND ENGINES.

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GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS;

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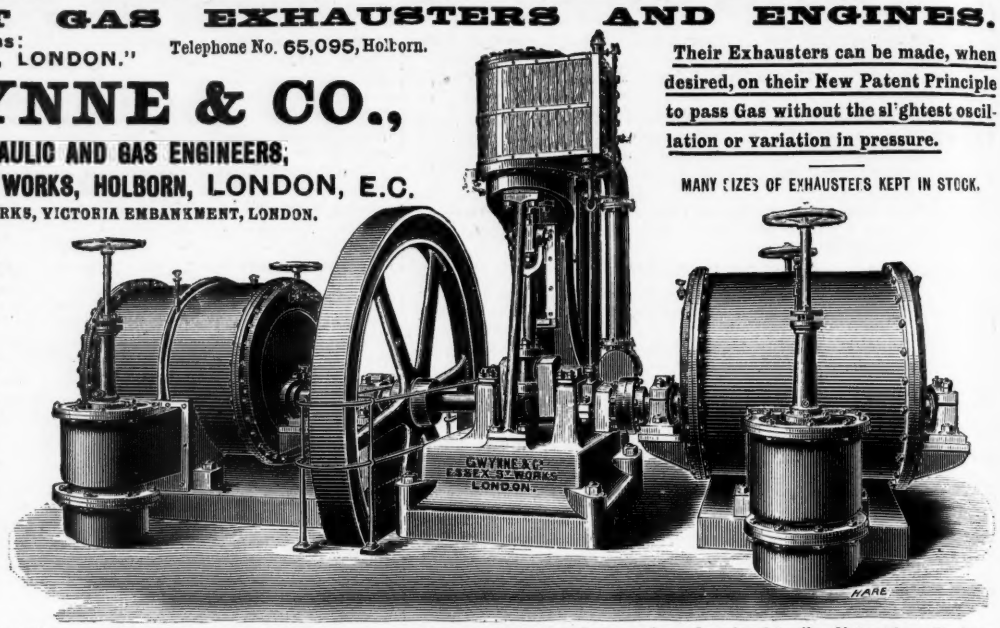

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Price 2s., Post Free.

STEPHEN CARPENTER, on the PURIFICATION OF COAL GAS BY LIME, OXIDE OF IRON, AND ATMOSPHERIC AIR, and the Method of Working Purifiers so that the Lime may be used a second time, with a Description of Carpenter's short Method of Working off the Sulphur Test, and Table for Calculating Results.
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GAS Companies in Formation, District Councils, &c., desirous of Lighting their Districts, would do well to consult the Advertiser.
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ADVERTISER (Age 30) requires Situation as GAS-FITTER. Well up in Iron and Compo. Pipe Work.
Address JAS. JONES, 2, Blackstone Street, Canton, CARDIFF.

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THOROUGHLY practical, smart young Man seeks Situation. Experienced in Fixing Meters, Gas-Stoves, Fires, and Incandescent Fittings, Compo. or Iron. Reference from Gas Company (over Six Years' Service). Wages moderate.
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GENTLEMAN, with extensive experience in Gas Engineer's and Manufacturer's Office, and accustomed to Travel, is open to ENGAGEMENT. Could introduce first-class connection among Gas Companies.
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ALEX. P. KER, C.E., Consulting Gas Engineer, Hunton Road, Gravelly Hill, Birmingham, 25 Years Assistant Engineer and Manager of Works to the Corporation of Birmingham and their predecessors, MAY BE CONSULTED on all matters connected with GAS ENGINEERING, including Valuations, Alterations, Additions and Extensions, &c. REPORTS upon EXISTING WORKS and IN PROGRESS. EXAMINATIONS OF GAS for ILLUMINATING POWER and IMPURITIES conducted. Plans, Specifications, and Estimates prepared.

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INCREASE the efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
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OLD Retorts made equal to new by repairing them with CROWTHER'S PATENT STICKFAST FIRE CEMENT. Unequalled for Repairing Inclines. Can be used in Hot or Cold Retorts; and "A1." for Mouthpiece Joints. Satisfaction Guaranteed.
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Strong action on Sulphuretted Hydrogen.
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WANTED, in the Petersfield Gas-Works, a STOKER for Night Shift (twelve hours). Wages, 21s. a week.
Apply before the 2nd of October, stating Age and Experience, with *copies* of Testimonials, to W. C. BURLEY, Station Road, PETERSFIELD.

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WANTED, a Works Manager. Salary £200 Sterling per annum, with Residence, Fuel, and Light. Passage paid and Contract for Three Years. Make of Gas, 50 Million Cubic Feet.
Candidates must be thoroughly conversant with the details of a Gas-Works, and have a practical knowledge of the construction and working of Generator Furnaces.
Applications, stating Age, Qualifications, and previous Experience, and enclosing *copies* of three recent Testimonials, to be addressed to the undersigned, and posted not later than the 30th inst.
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Gas Offices, Gibraltar,
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A VACANCY will occur next Month for a PUPIL in the Office of a Gas Engineer in the Midland Counties. A large portion of the Premium will be returnable as Salary during the Three Years' Apprenticeship.

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WANTED, at once, an experienced WORKING MANAGER, who thoroughly understands the Manufacture and Distribution of Gas, Main and Service Laying, Gas-Fitting, &c. Coal Carbonized yearly, about 250 Tons.

None need apply whose character will not bear strict investigation as to Sobriety, Honesty, &c.

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Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

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GAS-PUMP for Sale, horizontal, one Steam Cylinder, 18-inch bore, and two Gas Cylinders, 17½-inch bore, all 24-inch Stroke, on massive Bed-Plate, with heavy Fly-Wheels. Very strong. First-Class Make. Not much used.

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EIGHT or Four C. & W. Walker's Puri- fiers, 12 feet square by 4 feet deep, with Six 12-inch Bye-Pass Four-Way Valves and Connections, complete, with fixed Hydraulic Lifting Gear.

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HYDRAULIC MAIN AND RETORT-FITTINGS FOR SALE.

THE Directors of the above Company invite TENDERS for Six lengths of CAST-IRON 9 HYDRAULIC MAIN, with Standards, Ascension-Pipes, Dip-Pipes, Buck-Staves, and Tie-Rods to correspond.

Full Particulars can be obtained from the Engineer.

Tenders to be sent in addressed to the Chairman of the Newport (Mon.) Gas Company on or before Wednesday, the 6th day of October, 1897, endorsed "Retort-Fittings."

The Directors do not bind themselves to accept the highest or any tender.

By order,
EDWARD F. MARFLEET,
Secretary

THE GASLIGHT AND COKE COMPANY.

TENDERS FOR COKE.

THE Directors of this Company are pre- pared to receive TENDERS for the purchase of COKE, to be supplied into Barges or Railway Trucks at their Beckton, Nine Elms, Bromley, and Fulham Stations, within the Twelve Months ending the 30th of September, 1898.

Particulars and Forms of Tender can be obtained upon application at this Office.

Tenders to be sent in at or before noon on Wednesday, the 6th prox., addressed to me, and endorsed "Tender for Coke."

The Directors do not bind themselves to accept the highest or any tender.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., Sept. 24, 1897.

RAMSGATE CORPORATION.

TENDERS FOR GASHOLDER.

THE Gas and Water Committee are desirous of receiving TENDERS for a Three-Lift GASHOLDER; outside lift, 115 feet diameter.

Tenders to be sent in, addressed to the Chairman of the Gas and Water Committee, Hardres Street, Ramsgate, not later than Ten a.m. on Monday, the 11th of October.

Full Particulars will be given on application being made, enclosing cheque for £3 3s., which will be returned on receipt of a *bonâ-fide* tender, to

WILLIAM A. M'INTOSH VALON,
Engineer.

COMMERCIAL GAS COMPANY.

THE Directors of the Commercial Gas Company are prepared to receive TENDERS for the surplus BREEZE produced at their several Works for the Twelve Months ending Sept. 30, 1898.

The quantities are estimated to be as under, but the same cannot be guaranteed, and may be more or less:

At the Stepney Works, on the Regent's Canal—
2000 chaldrons (of 48 bushels) of Fine Coke Breeze, and
2000 chaldrons (of 48 bushels) of Rough Pan Breeze.

At the Wapping Works, on the River Thames—
2000 chaldrons (of 48 bushels) of Fine Coke Breeze, and
2000 chaldrons (of 48 bushels) of Rough Pan Breeze.

At the Poplar Works, in Bow Creek (free wat rway)—
4000 chaldrons (of 48 bushels) of Fine Coke Breeze, and
4000 chaldrons (of 48 bushels) of Rough Pan Breeze.

The tenders may be for the whole or for one or more Works separately.

The Contractors must give security to remove the Breeze as it accumulates, to pay for the same monthly, and generally for the due fulfilment of the contract.

The form of agreement to be signed can be seen at the Company's Offices.

Tenders, sealed and endorsed "Tender for Breeze," to be delivered here not later than the 7th of October prox.

The Directors reserve to themselves the right to accept any tender in part or in whole, and do not bind themselves to accept the highest or any tender.

Commercial Gas-Works, Stepney, E.,
Sept. 24, 1897.

By Order of the Directors.

THE SOUTHEND WATER-WORKS COMPANY.

SALE OF 500 SHARES.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, E.C., on Tuesday, the 19th of October, at Two o'clock, in Lots, 500 £10 SHARES (to be issued as fully paid) in the above Undertaking, ranking for a Maximum Dividend of 7 per cent.; the Dividend to the 30th of June last on the same class of Shares being at the rate of 5½ per cent. per annum.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTHEND GAS COMPANY.

SALE OF SHARES.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, London, E.C., on Tuesday, the 19th of October, at Two o'clock, in Lots, 20 £10 SHARES in the Southend Gas Company, ranking for a Standard Dividend of 7 per cent.; the last Dividend on the same class of Shares having been at the rate of 7½ per cent.

Particulars of the SECRETARY, at the Offices, SOUTHEND, and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

GAS STOCKS AND SHARES

IN THE
SOUTH METROPOLITAN GAS COMPANY,
NEW SWINDON GAS COMPANY,
UXBRIDGE AND HILLINGDON GAS COMPANY.

MR. ALFRED RICHARDS will Sell by AUCTION, at the Mart, E.C., on Tuesday, the 19th of October, at Two o'clock, in Lots, STOCKS AND SHARES in the above Companies.

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Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

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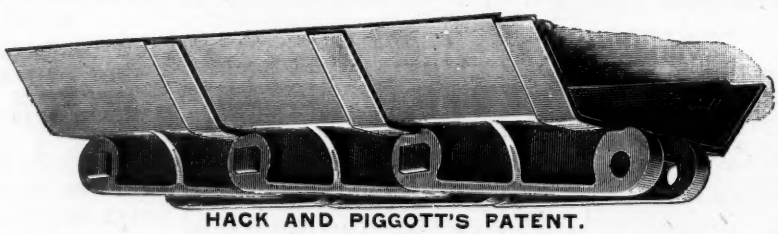

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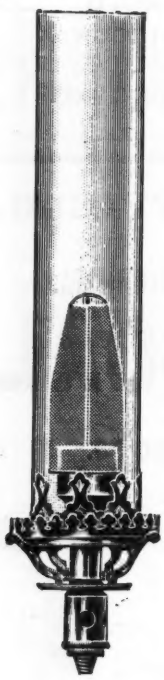

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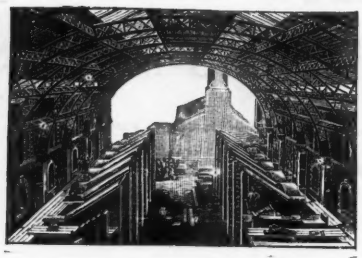

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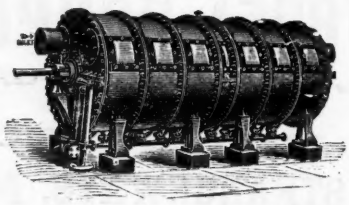

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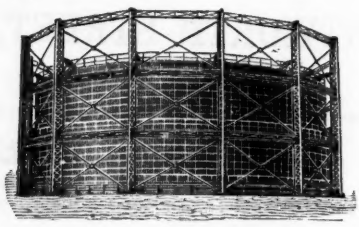

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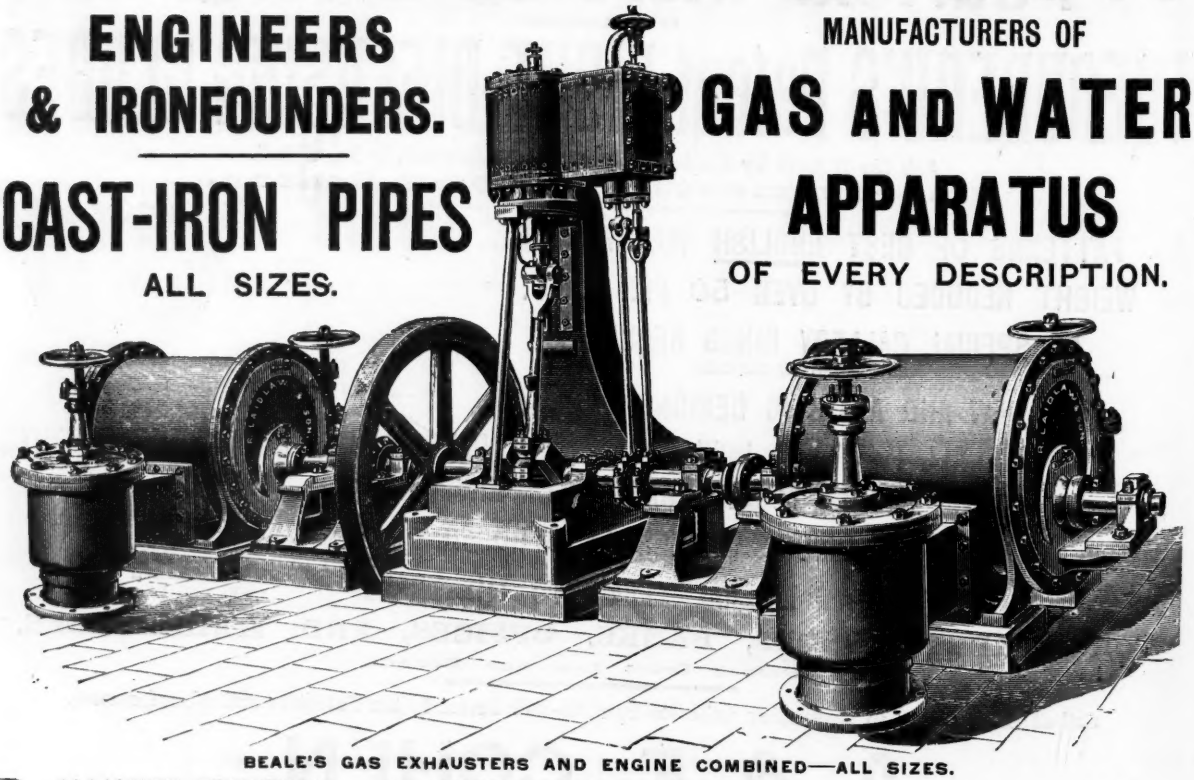

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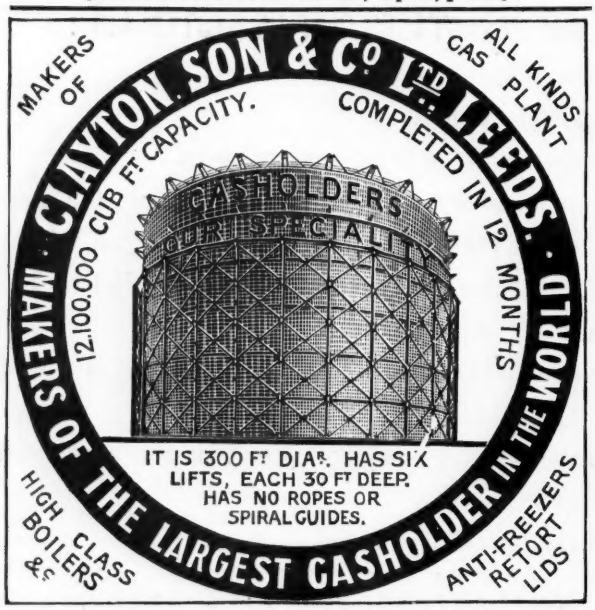
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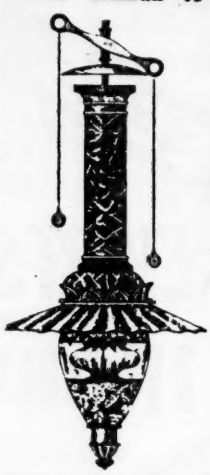

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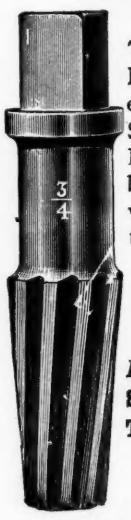

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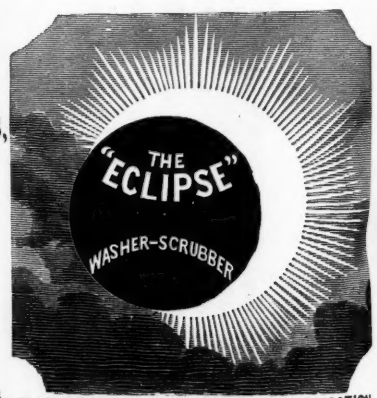

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